MAY 1959

VOLUME 4 • NUMBER 5

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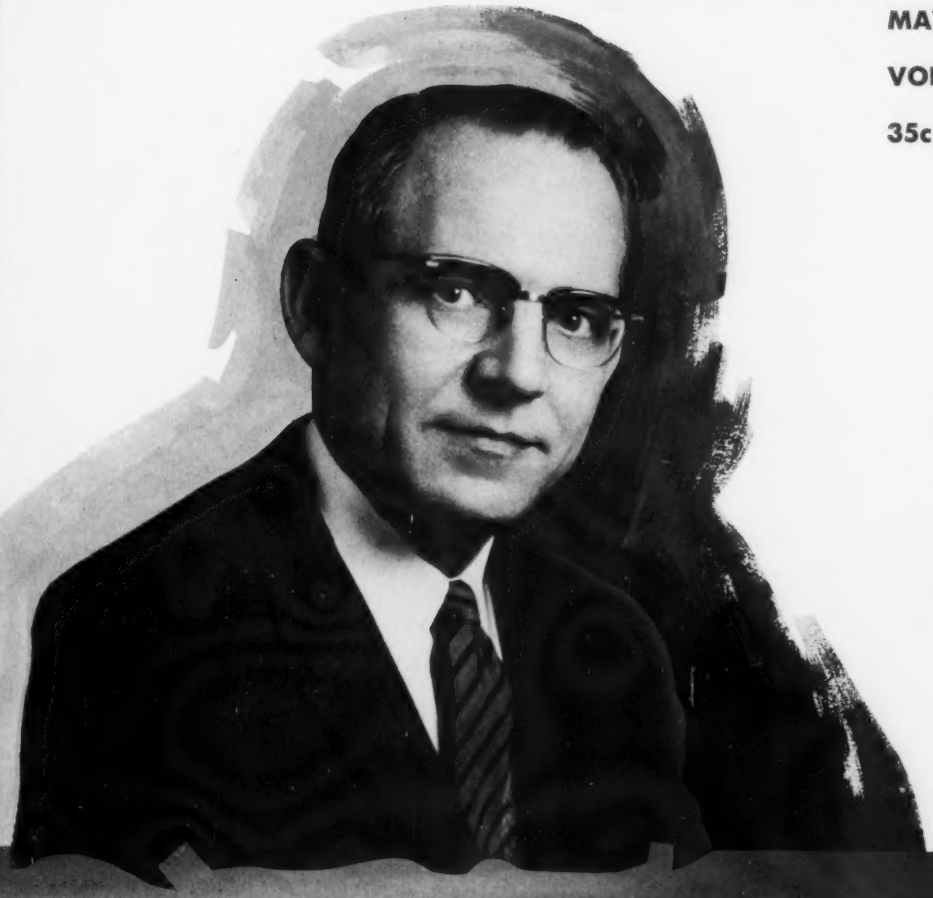

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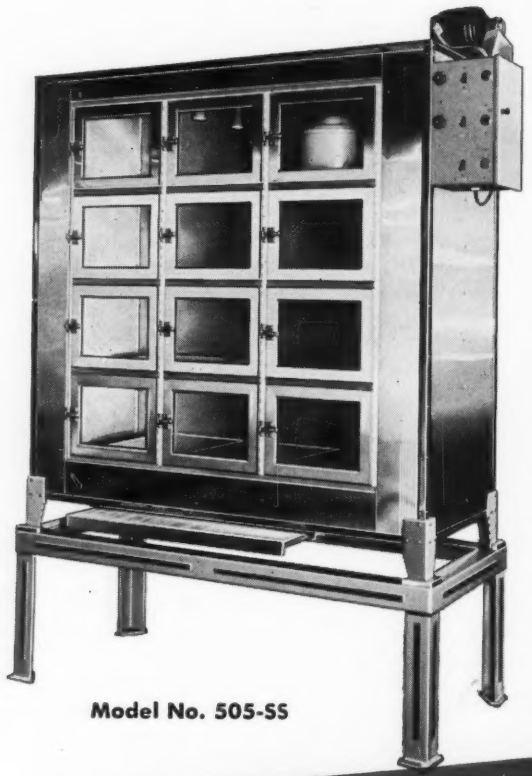

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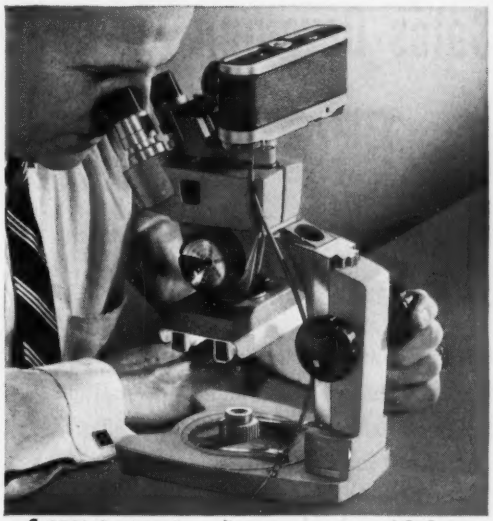

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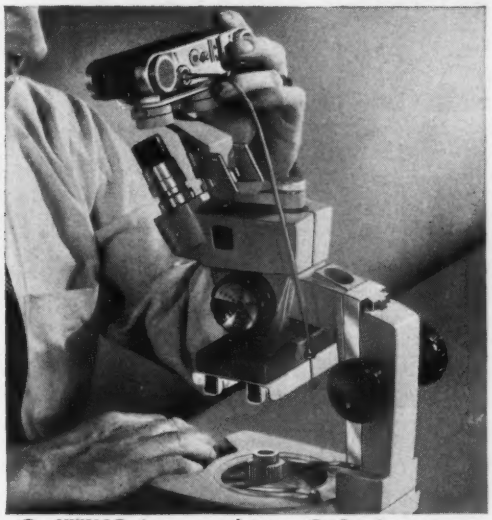

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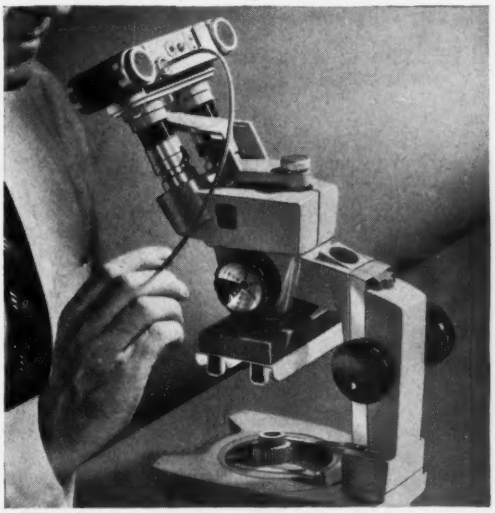

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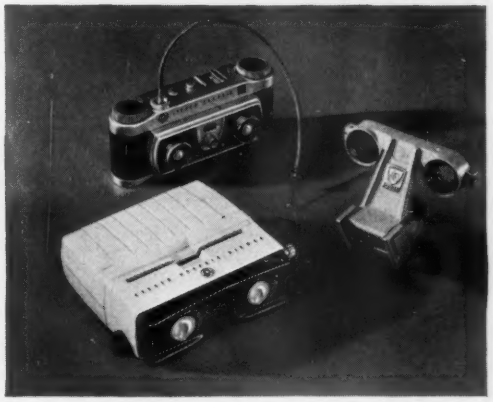

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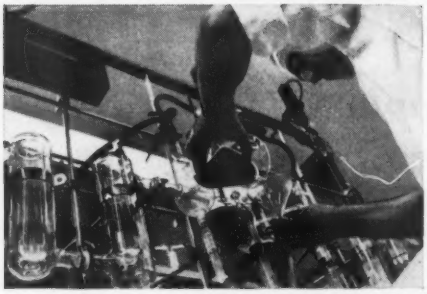

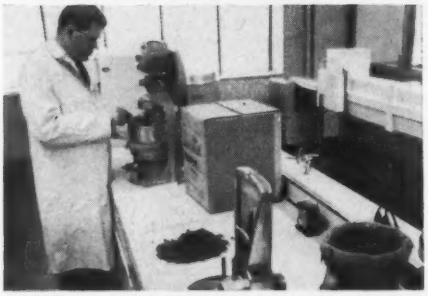

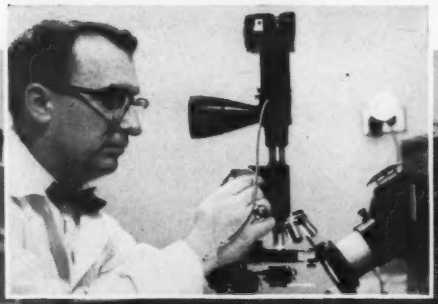

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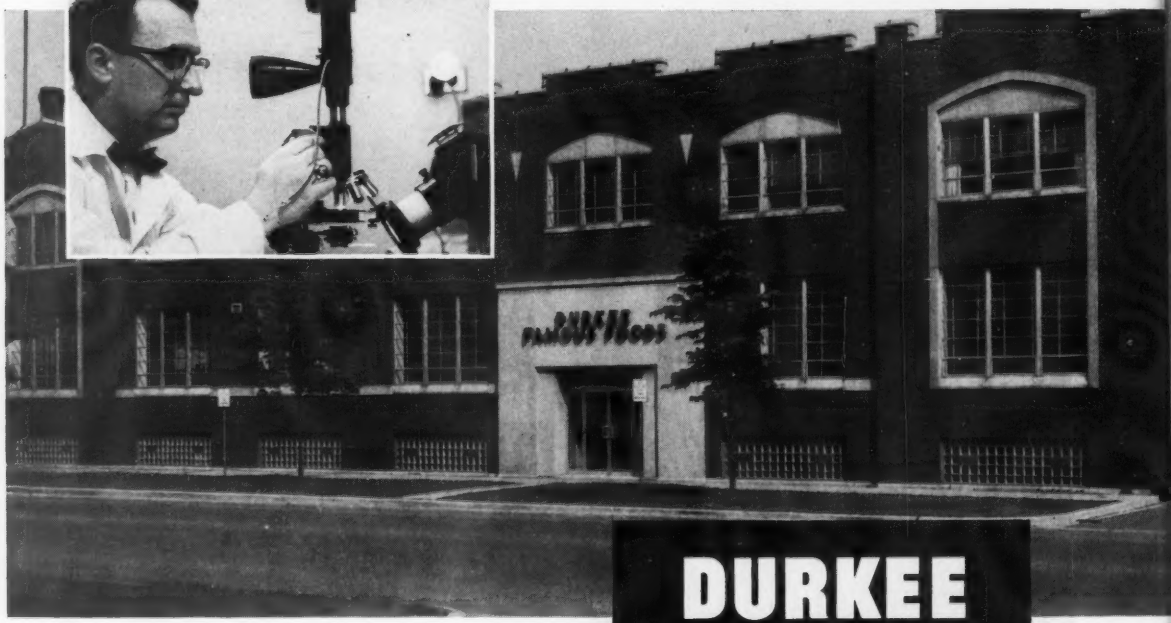

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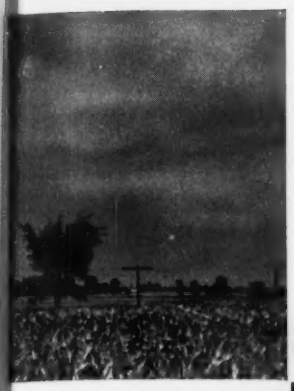

CEREAL SCIENCE today

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New President, American Association of Cereal Chemists

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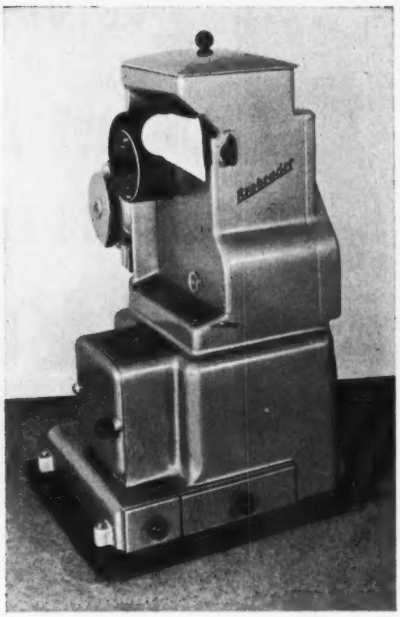

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Editorial

PUBLICATION OF THIS issue of CEREAL SCIENCE TODAY was delayed so that it might carry news, speeches and photographs from the forty-fourth Annual Meeting of the American Association of Cereal Chemists.

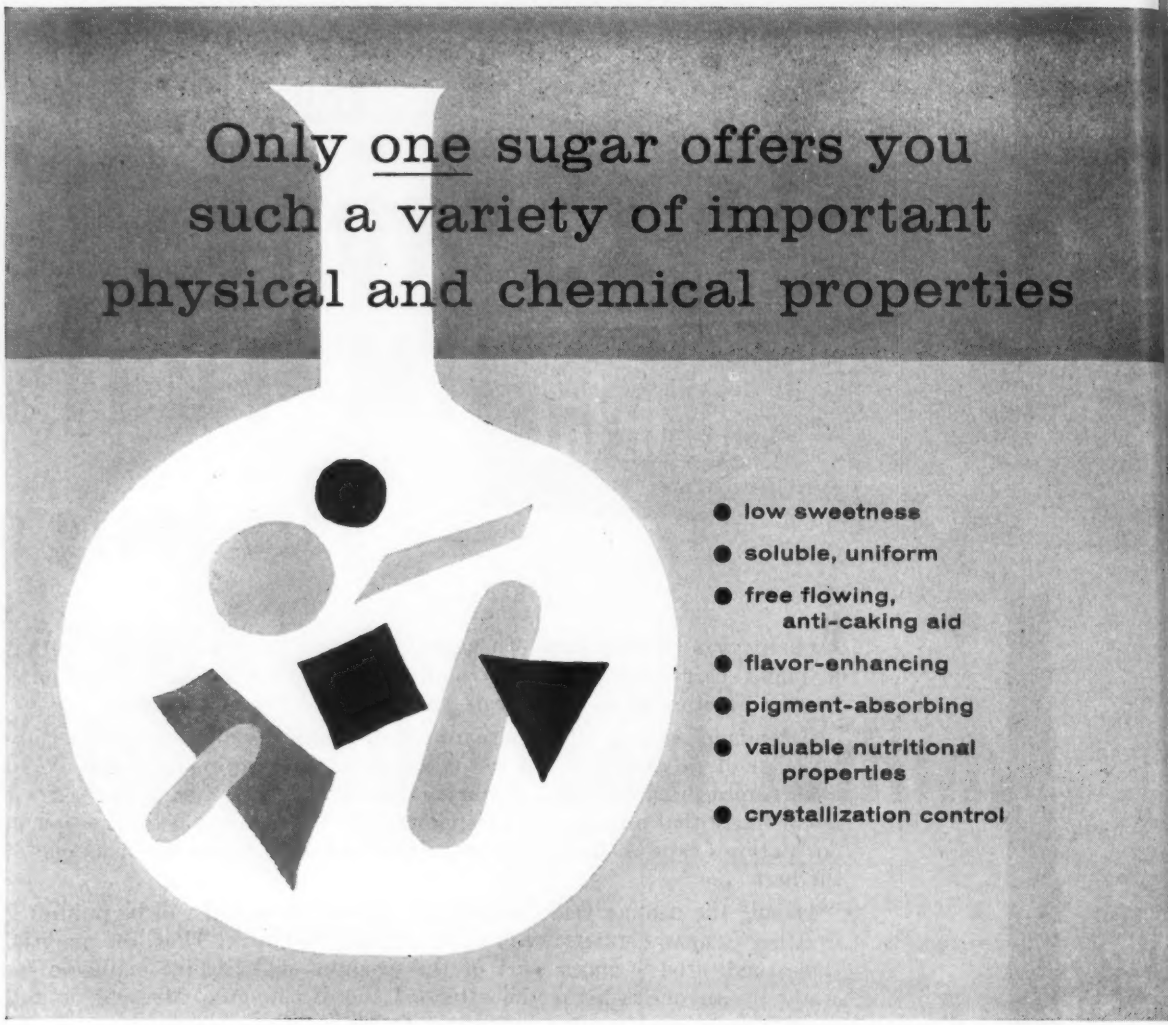
Attendance at and participation in such a meeting offers a unique combination of professional and social values to each individual present. In an organization that has a history of well-planned, well-run meetings, it is not likely that anyone was disappointed in the one just held, the first in our nation's capital. All who were present will long remember it as one of the best.

During the coming year, most of the papers presented will be published in either CEREAL CHEMISTRY or CEREAL SCIENCE TODAY. Thus, the material that constituted a major part of the program will become available for study by anyone, whether he attended the Washington Meeting or not. Sometimes it can be very important to hear a paper several months before it appears in print. More often, a greater value in meeting attendance lies in the opportunities that are afforded to meet, become acquainted with, and discuss research and technical problems with one's fellow cereal chemists.

This year's program was planned to provide papers whose contents would have practical value by adding to the knowledge and tools available to every cereal chemist, no matter what his special interest or specific responsibility might be. Concurrent sessions were held to make this possible. With the more flexible scheduling, smaller audiences, and greater homogeneity of audience interest that can go with concurrent sessions, they may offer a means of providing more opportunity for discussion from the floor of papers presented in technical sessions. Such a discussion was once an important feature of all scientific meetings. With the increasing pressures limiting the time allotted to each paper, such discussion has, to the regret of many participants, tended to disappear from our meetings.

We believe we can speak for all members of the AACC and all others who attended the Washington Meeting in expressing the deepest gratitude and appreciation to all responsible for planning and conducting it. The facilities and the programs, both technical and social, were excellent.

P.E.R.



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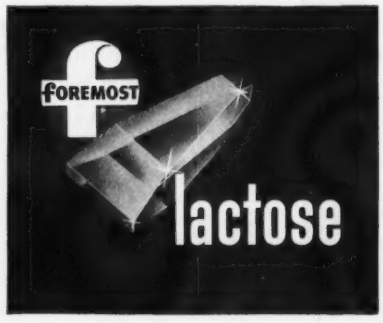

LOOKING AHEAD FROM AACC'S 44TH MILESTONE

Presidential Address

By Clinton L. Brooke, Merck & Co., Inc., Rahway, N. J.*

IT SEEMS PARTICULARLY appropriate that the American Association of Cereal Chemists should be meeting in the Nation's Capital at a time when cabinet representatives from Argentina, Australia, Canada, and France are meeting with Secretary Benson to discuss the problems of channeling wheat surpluses to the world's needy. It is fitting that we cereal chemists, whom I have characterized as "custodians of the quality and uniformity of the foods that form the basis of the diet of the great majority of mankind," should consider during the next four days some of the many ways of utilizing the cereal grains, not only as foods for man and for animals, but as sources of valuable industrial chemicals, vitamins, and antibiotics.

During the year that has passed since I assumed the office of President of this Association, I have had the privilege of visiting most of our sixteen Local Sections. I regret that I was not able to cover them all. I can say with confidence that the Association is in good condition and that a fine spirit prevails in all the Sections.

The membership of our Association has increased rather slowly in recent years. Changing times, reduction in the number of mills, bakeries, and other cereal-processing units have caused us to wonder about future prospects for growth. Currently we have 1,200 members. During the past year our Membership Committee has conducted a survey to determine potential membership. The survey is not yet completed, but a preliminary report indicates at least 500 potential members in the United States and Canada.

Both my immediate predecessor in the Presidency, Dr. Bradley, and his predecessor, Dr. Zeleny, pointed out in their presidential addresses that the AACC is truly an international organization — that we are represented in 26 different countries and in all the continents of the world, and that our publications are sent to 68 foreign countries. It seems appropriate to point out here that the name "American Association of Cereal Chemists" is in no way restrictive, and that membership is open to cereal chemists and technologists in any country. While our membership is largely drawn from the United States and Canada, we are keenly aware of the importance of our colleagues in other countries, whether they be members of our Association or not, and we are deeply appreciative of their contributions to the field of cereal chemistry, as reported in our own journals and those of other countries.

Avenues for Growth

It is possible for the Association to grow through attracting more of the men working in cereal laboratories in our own country and through interesting more foreign cereal chemists. But is this enough? Is it not necessary for us to broaden our scope? At our Annual Meeting in 1950, President Hildebrand pointed out that by extension of our services to those who have interests in the technology of cereal grains apart from milling or baking, we should bring to our meetings people in other fields of endeavor. Dr. Hildebrand recognized that such a policy would undoubtedly present some practical problems in maintaining a service for persons with more widely diversified interests, but he felt that these problems should not be insurmountable. He warned that the alternative course of restricting our Association interests would seriously hamper future progress.

We have had before us for several years the question of providing, to borrow a phrase from John A. Johnson, a room in our Association house for the feed analysts. During the administration of Hugh K. Parker in 1951–1952, steps were taken to interest feed chemists in our Association, and since that time we have attempted to present papers at our annual meetings and to print material in our publications which would be useful to the feed chemist. An increasing number of our members are connected with companies that manufacture feed ingredients or complete feeds, as well as products for human consumption, and these men are expected to be competent in both fields. In addition to the men in the laboratories of commercial feed manufacturers, we should include chemists in state and Federal control laboratories, in experiment stations and colleges, in independent commercial laboratories, and in the laboratories of the numerous ingredient manufacturers. Here we have a group of chemists whose number has been estimated at several hundred.

We are advised that the feed chemist in industry has at present no association to call his own. The issue before us now is to decide upon ways and means of providing a room in our house for the feed chemists and to provide adequately for these people in our annual meetings and in our publications.

Now that we have come of age, we need not be afraid of concurrent sessions at our annual metings — several

* Presented at the 44th annual meeting, Washington, D.C., May, 1959.

lie before us during the next few days; and our publications can expand as circulation rises.

Steps Realized and Projected

I shall now report to you a number of forward steps taken by our Association since our last Annual Meeting. As you all know, our national offices and publication headquarters have been located in the Biochemistry Building, University Farm, St. Paul, Minnesota, since 1943, when W. F. Geddes became Editor of CEREAL CHEMISTRY. For this long period of tenancy, at no cost to the Association, we are deeply grateful to Dr. Geddes and to the University of Minnesota. But we are outgrowing our quarters, and it has become necessary to seek a new home. At the January meeting of the Board of Directors in Minneapolis, Treasurer Howe and President-elect Pratt were delegated to investigate locations not too far from the Farm Campus and its indispensable library, and not too far from the printers who do such a fine job on CEREAL CHEMISTRY and CEREAL SCIENCE TODAY.

I am pleased to inform you that new office quarters have been found at 1955 University Avenue, St. Paul 4, Minnesota; that the Board has voted approval; and that the move will be made around June 1.

In 1955 the Association engaged an advertising representative, located in Chicago, to solicit advertisements for Association publications. That responsibility has now been delegated to Ray Tarleton, who will wear one more hat as advertising representative. The Board made this move in full confidence in Ray's ability to build up the advertising revenue from our publications.

The three Insect Fragment Identification Training Schools held during the year at Albany, California, New York City, and Chicago have reflected great credit upon the Association and upon our members who gave so generously of their time and their talents to make these schools a success. To Kenton Harris and O'Dean Kurtz we express our heartfelt thanks for their distinguished service in conducting these schools.

A new edition of *Cereal Laboratory Methods*, the 7th, is being planned. It will be a loose-leaf book this time, probably with annual revisions. Deadlines have already been set up, and the planned publication date is February 1, 1962.

Looking to AACC's Future

In his presidential address at Minneapolis in 1951, John Shellenberger stated that we should give immediate and serious thought to the scientific standing of our Association. He was concerned by the fact that cereal chemists were apparently no longer consulted about any of the major problems that confront the nation in times of stress.

We hope that this is no longer true. More and more opportunities are being afforded our Association to cooperate with such important government agencies as the Food and Drug Administration in connection with the recently enacted Food Additives Amendment; with the Commodity Stabilization Service in connection with protection of vital food facilities against fallout; as well as with scientific and technical organizations whose interests are allied with our own. We believe we have reached better understanding with these organizations, and that we have achieved greater recognition of the importance of our Association.

As the American Association of Cereal Chemists, we believe that it is our duty not only to uphold the high standards of quality and uniformity in cereal products, but also to make sure through study and experimentation that these products are as clean and as well balanced nutritionally as it is possible to make them. It is our duty to be cognizant of the latest advances in nutritional science, and to neglect no opportunity to take such steps as lie within our power to increase the consumption of cereal products.

When I assumed the presidency of this Association in April of last year, I pointed out in my brief remarks at the Annual Banquet that although we had been hearing about the potentially great contributions that the cereal chemists can make to our future, we cereal chemists had been told that we were looking and directing our efforts too exclusively at baking and baking performance of flours. We were told that we must find out with greater accuracy and completeness just what is in the wheat kernel, as well as the corn kernel and the rice kernel and all the other cereal products in which we are interested.

It was with these friendly criticisms fresh in our minds that we set about planning our 1959 program. As you have noted in the news releases, our theme this year is "Diversification." Will you bear with me while I repeat what I have said in the Foreword to this Program: "We plan during the next few days to illuminate our corner of the world through the presentation of many carefully prepared papers, all designed to aid us in ascertaining truth, and all aiming to expand our vision of the world in which we live."

Important Notice

Effective June 1, 1959, the editorial and business office of the AACC including its two publications, CEREAL CHEMISTRY and CEREAL SCIENCE TODAY, will move to new quarters. Correspondence should be addressed to:

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St. Paul 4, Minnesota

Please change your records accordingly so that your mail will not be delayed.

THROUGH AN EMINENT REPRESENTATIVE

Industry Speaks Out — for Good Nutrition in Cereal Products

By Herman Steen, Vice President, Millers' National Federation*

MY APPEARANCE BEFORE you today was occasioned by a chance conversation with your president, Clint Brooke. The date of that conversation was some months ago. Clint had the preliminary outlines of the program for your conference here in Washington. With one exception, every approach to your field of interest appeared covered. The notable exception suggested the title of my remarks: "Industry Speaks Out — for Good Nutrition in Cereal Products."

We all look at a loaf of bread from our own particular viewpoint. I suppose the farmer looks at bread and sees the dramatic, seasonal cycle of plowing, harrowing, drilling, worry, and harvest. The nutritionist looks at bread and sees in it a carrier for certain chemical compounds known as nutrients that provide materials for body heat, energy, maintenance, and growth. Secretary Ezra Taft Benson looks at bread and sees mountains of wheat that threaten to inundate the economy of the nation. The schoolteacher may see bread as part of history. The clergyman is reminded of the Lord's Prayer. The advertising man sees it as a radio or television commercial, a display in a newspaper or on a billboard.

How do *you* look at a loaf of bread, a bowl of cereal, or some other product of cereal grain?

Within these four walls there is a wide range in our points of view concerning bread, indicative of the vast complications in the industrial process that brings a loaf of bread or a bowl of cereal from the farm to the table.

The complications in the production and delivery of bread to the consumer are relatively new — new for millers and bakers as they are for other producers of foods in America. Even in the relatively few years of my own adult life, spent mainly in working for the milling industry, the milling-baking-marketing cycle of cereal products has grown unbelievably complex. For example, it wasn't too long ago that a cereal chemist was a rare creature indeed, outside the campus of a college or university. Today you meet here as a group, the majority representing industry.

From our various viewpoints, our reason for being here springs largely from the spirit of competition and the need to sell the products of wheat. Those products are sold, like any goods, largely on the basis of superiority. Our products must be better — possessed of real or imagined and invented points of superiority.

The "Yeast" of Competition

Within the area of interest expressed here today, the striving for betterness of product began with quality control and the desire to maintain standards of performance. This moved the cereal chemist out of the laboratory-classroom into industry. It was a new frontier in industry, and as a pioneer the cereal chemist began to make other improvements proving his worth. Accordingly we find the beginnings of the vast technological advances made by the milling-baking industries over the past years. A competitive striving for product and processing superiority has resulted in benefits for all.

One of the wonderful things about human beings is that they require whatever they do to be important. Accordingly, the improvements in products and in methods of processing must be important — to the chemist, to the manufacturing organization for whom he works, and finally to the public. Begin work for product improvement at any point, and inevitably you reach a point where you ask yourself, "What does it all mean?"

At that point, you begin working not only for yourself, but for your fellow-man. And inevitably, in relation to wheat flour foods, product improvement introduces questions of nutritional merit.

Nutritional Improvements

All the advantages of quality control, performance, processing, improved shelf-life, packaging, and marketing would be pointless were it not for the fact that we can honestly tell ourselves that breadstuffs and cereals are good foods, nutritionally improved and better than they were thirty or even twenty years ago. The nutritionists among you know how seemingly unrelated discoveries in their field have contributed to the nutritional improvement of breads and cereals, with the discovery, isolation, and synthesis of vitamins during the 1930's, the enrichment of breadstuffs, the further investigations in proteins and fats.

It is truly remarkable that the discoveries and happenings so widely scattered across the globe could come together and be combined to make possible the nutritional improvement of breadstuffs and cereals for basic product improvement. Recognizing the responsibility from which no one who has to do with food can escape,

* Presented at the 44th annual meeting, Washington, D.C., May 1959.

the milling industry long ago summed it up in the statement that "those industries which exist by reason of the nutritional needs of the nation share in the responsibility for public health dependent upon food."

This fundamental principle is one of the planks of the platform upon which the milling industry built the Wheat Flour Institute more than thirty years ago. It is a principle implicit in the campaigns of consumer education also conducted by the American Bakers' Association, the American Institute of Baking, the Cereal Institute — as well as individual companies and organizations with total or partial interest in greater consumption of breadstuffs and other cereal products.

Consumer Education

Just within the past few years, this campaign has been joined by state organizations of wheat growers. More recently, the state organizations have formed up in regional groups, to beef-up still further the united campaign of a united industry speaking out, for good nutrition in cereal products.

Cereal foods enjoy certain traditional and everyday advantages, which I'm sure you all know. Through your work and the campaigns of the companies you represent, the advantages or points of product superiority for wheat flour foods have been spelled out. From the consumer's standpoint they are convenient, readily available, economical, universally popular. In a sense they offer no competition to other foods, because they are "go-togethers." And finally — of increasing importance as the campaign for public education progresses — they provide a full measure of good nutrition.

We should make a distinction between individual, company-name, brand-product promotion and the separate campaigns carried forward in behalf of the basic commodities — wheat, flour, breadstuffs, and end products such as those the baker or breakfast cereal manufacturer offers to the public. Company promotion of cereal products largely features certain brands, with slight overtones of nutrition. (I regret to be obligated to say that in too many cases, individual company usage of nutrition angles leaves something to be desired from a factual standpoint, probably owing to advertising agency influence.) The jointly sponsored campaigns of growers, millers, bakers, and cereal manufacturers concentrate almost entirely on telling the points of product advantage with heavy stress on nutrition.

The industry campaigns are based primarily on stimulation of the market with new ideas for product use, in the form of recipes, and on improving the product image through nutrition education, working through mass media of communication, in school programs, in campaigns for professional education.

The nutrition education approach poses certain basic problems. You cannot expect a homemaker who knows nothing of nutrition to become aware of or to recognize the nutritional merit of wheat flour foods. Accordingly — along with those of other food commodity groups — the campaigns for the industries represented by cereal products begin by teaching nutrition fact.

Under dozens of different titles printed material has been prepared — literally tons of it — for use with consumer groups, in home economics, in elementary, secondary, and college-level classes. Similarly, immense quantities of materials for professional education are available: booklets, charts, pamphlets, filmstrips, movies, posters, and other materials especially designed for the physician, the dentist, the nurse, the nutritionist, the dietitian, the teacher, the public health worker, and lay leaders within the field represented by such a category.

Over the years, millions of dollars have been spent in this work of nutrition education, to overcome the apathy or ignorance of the public towards breadstuffs and to gain public recognition of cereal products for their nutritional merit.

Materials are distributed personally by workers in the field, ordered from catalogs, advertised at the professional level, made available for examination and review at professional meetings, mailed on request after solicitation of interest in any one of a dozen different ways.

Results and Prospects

Is this campaign effective? To this point, we have proceeded largely on faith that the way to gain recognition of cereal products for their nutritional merit has been to teach nutrition. And if the USDA per-capita consumption index (now steady for two years at about 120 pounds) is any indication, we have perhaps at long last begun to succeed.

But in no sense is the campaign over, nor is it even partially successful. We are subject constantly to the brickbats of the food faddist and the quack. Each new year brings a new crop of consumers to be educated once again. It is a never-ending, uphill fight.

We are engaged in a constant struggle in which, perhaps, our individual efforts mean little or nothing. But together, collectively, we can see certain signs of progress. In addition to the per-capita consumption index, there appears to be a notable change of professional attitude. Surveys of public opinion indicate greater knowledge of nutrition and consequently greater likelihood of cereal product acceptance on the basis of nutritional merit. The teachers of America, responsible in part for the food attitudes of more than 40 million students, appear more favorably inclined toward cereal products. Even the Government, where the USDA reflects national preoccupation with milk and meat, appears to be more favorably disposed towards cereals. The pressures of our bulging, overflowing national grainery are at last exerting themselves in our favor.

The Cereal Chemist's Role

As cereal chemists, you have more than an academic interest in this problem. Some of you are policy-makers in your own organizations. All of you can influence the thinking and attitudes of those around you in behalf of nutrition education. Your own welfare and the future of your companies and organizations are in some measure dependent upon the ultimate success of the continuing campaign in behalf of nutrition education. Many of you are in a position even more critical to the future of the cereal industries — a position from which you can stimulate professional interest in nutrition research, research to provide the facts for our story of the nutritional merit of cereal products.

One more final request. No matter how technical or insular your interest

(Please turn to page 149)

Nutrition-Conscious Customers Buy Fortified Products

You gain an edge over competition, create excitement *and* sales by fortifying with Merck Vitamins and Amino Acids. Almost any processed food is a candidate for fortification, and you can choose from nearly a dozen Merck Nutrients—all easily adaptable to normal food processing operations.

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AACC IN WASHINGTON, D.C.

New officers of the AACC for the year 1959-1960. Left to right, John A. Johnson, President-Elect; D. B. Pratt, Jr., President; Miss Marjorie Howe, Treasurer; James W. Pence, Secretary.

THE ASSOCIATION'S 44TH Annual Meeting in Washington, D.C., May 3-7, will go down as one of the largest with 798 members, guests, and wives in attendance and technical sessions reporting standing-room-only.

Hurried last-minute preparations were necessary to accommodate the more than 196 ladies who attended the meeting.

High interest was evident at the packed technical sessions, planned by Program Chairman Frank E. Horan, Hercules Powder Co., as 67 members and guests presented papers.

President Clinton L. Brooke, Merck & Co., who gave the keynote address, and three prominent speakers highlighted the 4-day meeting. Talks were given by: Arnold E. Schaefer, Executive Director, Interdepartmental Committee on Nutrition for National Defense, National Institutes of Health, Bethesda, Maryland, George W. Irving, Jr., Deputy Administrator of the USDA's Agricultural Research Service, and Herman Steen, Executive Vice-President of the Millers' National Federation. Their talks appear in this issue. The remainder of the technical papers will appear in one of the Association's two publications (CEREAL CHEMISTRY or CEREAL SCIENCE TODAY) sometime during the coming year.

Competent planning by the Local Arrangements Committee, headed by Kenton L. Harris, Food and Drug Administration, signaled success at the meeting which included 14 exhibitors (a record), a banquet serving 500, and 477 technical registrants.

Visiting scientists from overseas as well as 70 top government scientists attended the annual conclave. Australia, Germany, The Netherlands, Yugoslavia, Pakistan and Japan were represented.

All past presidents of the Association in attendance at the meeting were honored at the festive President's Reception and Mixer which opened the social activities at the Statler-Hilton on Sunday, May 3.

A silent film, taken at the 1931 annual meeting in Louisville, Ky., by Leslie R. Olson, was thoroughly enjoyed by Association "old timers" present.

The flour judging contest was an interesting and challenging innovation for members. Contestants were required to "match up" four samples of wheat with the appropriate flour milled from the samples, as well as with baked goods made from the flour. Only one member, Norman G. Irvine, Grain Research Laboratory, Winnipeg, was successful in the attempt.

Left to right, Wilfried P. Seibel, Federal Research Institute of Cereal Industry, Detmold, Germany; Arie H. Bloksma, Institute for Cereals, Flour and Bread, Wageningen, Netherlands; John Dempster and Walter Bushuk, G. R. L., Winnipeg.

Betty Sullivan, Russell-Miller Milling Co., and Lynn H. Pankey, Wilkins-Rogers Milling Co., check in at the press table during the meeting. Seated is Panalee Ikari, Division of Microbiology, Food and Drug Administration, in charge of publicity.

Scene from one of the several continental breakfasts held for the wives of members.

Upper right, Mabel E. Baldwin, Lakeland, Fla., Majel M. MacMasters, Northern Regional Laboratory, Peoria, Ill., and I. Hlynka, Grain Research Laboratory, Winnipeg, Canada, enjoy a pre-banquet conversation.

More banquet scenes with B. Marlo Dirks, Procter & Gamble Co., Cincinnati, and Robert A. Bottomley, Mauri Brothers and Thompson, Ltd., Sydney, Australia, chatting with their table companions.

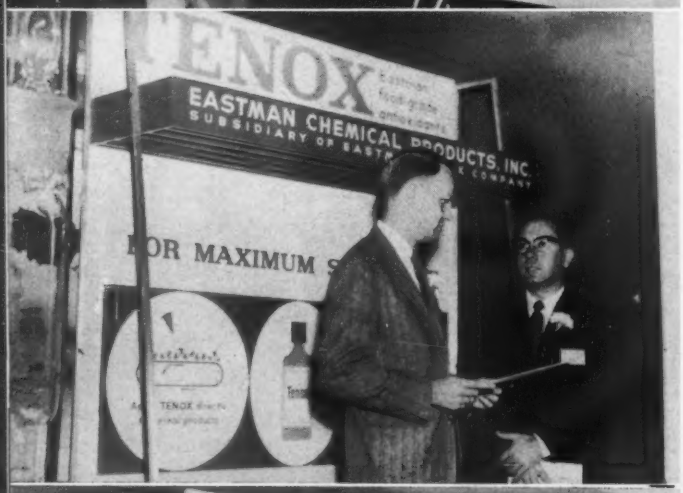
Mrs. Obenauf and husband Carl, Beatrice Foods, Chicago, discuss next year's meeting in the windy city with friends.

Right, beginning, and left, end of the reception line at the Sunday Mixer and President's Reception.

A group of AACC members discussing the technical session just ended.

FRIES & FRIES, INC. • Facing camera left to right, Bob Fries, Jr., Mrs. Fries, Donald C. Meek, Pillsbury Co., Minneapolis, and Louis Mignacca of Fries & Fries, Inc., Cincinnati.

CHAS. PFIZER & CO. • Left to right, John Post, Pfizer & Co., Mrs. Post, Charles Feldberg, Pfizer & Co., and Mrs. Feldberg.



EASTMAN CHEMICAL PRODUCTS, INC. • Frank D. Hannah, Eastman, discusses new products with Robert A. Bottomley, Mauri Brothers and Thompson Ltd., Australia.

C. W. BRABENDER INSTRUMENTS, INC. • Left to right, C. W. Brabender, President, and August O. Schmitz, Technical Vice President.

MERCK & CO. • A. J. Accola, Jr., left, and John F. Mahoney, right, both with Merck & Co. at Rahway.

Old friends comparing notes on progress of meeting. Left to right, Ric Palomba, Anheuser-Busch, Inc., Old Bridge, N.J., Clinton L. Brooke, Merck & Co., Rahway, and C. G. Harrel, Minneapolis.

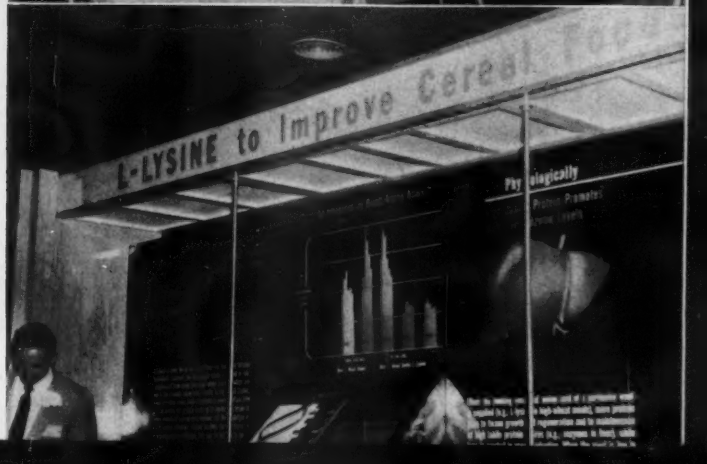
STERWIN CHEMICALS, INC. • Left to right Robert Larsen, Pillsbury Co., Minneapolis, F. A. Baldauski, Sterwin Chemicals, James W. Pence, WURD, Albany, Calif., Larry F. Marnett, C. J. Patterson Co., Kansas City, and W. L. Rainey, Commander-Larabee Milling Co., Minneapolis.

BRABENDER CORPORATION • Left to right, Richard R. Gartner, Mrs. Baird's Bakeries, Inc., Dallas, Arthur Hartkopf and Daniel Ringers, Brabender Corp., Rochelle Park, N.J.

AMERICAN OPTICAL CO. • Robert G. Grabo of AO taking a brief breather after demonstrating some interesting new optical equipment.

E. I. DU PONT CO. • Harold Rice of DuPont at the side of the meeting's most colorful and interesting exhibit.

A Wallace & Tiernan flower girl pins the traditional morning carnation on John Dempster of the Grain Research Laboratory, Winnipeg.



Left, President Clinton L. Brooke presents the President's Recognition Scroll to Past President W. B. Bradley during the banquet ceremonies.

Right, Eric A. Borel, Hercules Powder Co., chats with Mrs. Horan and husband Frank, also with Hercules.

National and Local Section Officers hold luncheon meeting to discuss AACC activities. Left to right, Edward I. Feigon, Kitchen Art Foods, Chicago, and Stanley A. Watson, Corn Products Refining Co., Argo, Ill., both from Midwest Section. Next, Edith A. Christensen, USDA, Beltsville, and O'Dean Kurtz, FDA, Washington, both from the Chesapeake Section.

Left to right, Paul R. Templin, J. R. Short, Canadian Mills, Ltd., Toronto, Toronto Section; Avrom R. Handleman, Monsanto Chemical, St. Louis, Central States Section; Lester J. Brenneis, Harris Milling Co., Owosso, Mich., Cincinnati Section.

A group of AACC members from Pioneer Section planning day's activities.

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One pound will replace 10 lbs. of #14 Brown Sugar
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Consult our Research Laboratories on your Problems

ONE OF THE WORLD'S BASIC FOODS

Rice (Oryza sativa)

By Robert R. Mickus, Rice Growers' Association of California, Sacramento, California

RICE IS THE largest field crop in the world, and its seed or grain is the basic food of more than half the world's population. In many countries this single item comprises 70 to 80% of the entire food intake. Though the wheat acreage of the world is about twice that of rice, the yield of rice per acre, about twice that of wheat, enables it to top wheat in world production by 10 to 20%. In spite of lower milling yields and bushel weight, rice still exceeds wheat in supplying calories for human consumption.

Growing Conditions

Contrary to the general understanding, rice does not have to stand in water to grow. It is frequently raised in flooded fields, but the major purpose of this irrigation is to kill weeds — the cheapest method of cultivation. The rice plant will grow, however, without flooding. One-fourth of the South American rice crop is grown on rolling-to-hilly lands without irrigation of any kind and where the water runs off after each rain. Much of the rice of Asia and Africa is grown by similar methods.

Nor is rice necessarily a hot-weather crop. It is grown in northern Japan and Korea, and at the foothills of the Alps in northern Italy, under climatic conditions that are too cold for corn, tomatoes, and other similar temperate-climate crops. It is produced at altitudes of 4,000 feet in Peru, 6,000 feet in the Philippines, and as high as 10,000 feet in the Himalayas of India. Thus, rice is produced under more varying climatic conditions than is any other major crop. This adaptability is the major reason for its importance as a food crop.

Varieties

This paper deals mainly with the species *Oryza sativa*, to which all U.S.-grown varieties belong. Elsewhere, the number of varieties reaches into the thousands, exceeding the number known for any other cereal crop; it very probably exceeds the combined number in all other cereals. In fact, the number of known varieties in China has never been established.

A stalk of the rice plant.

India, Java, Indo-China, Japan, Ceylon, and the Philippines combined list more than 15,000 varietal names. However, in the wide distribution of the rice plant there is without doubt a great deal of duplication in varietal names because of restricted knowledge between areas where local names become attached.

In the modification of any given variety, many factors play a part. Plants in general are notorious hybridizers. Because the transference of pollen by insects or other agencies cannot be adequately controlled, hybridization has gone on uninterruptedly. In the rice plant, the resultant combinations, stable or unstable, complicate the varietal picture. Mutations certainly must have added numbers to the list. Selection, conscious and natural, has released latent differences which, under conditions of a new environment, whether accidental or controlled, have been given an opportunity to express themselves. Germinal differences, stemming from hereditary reservoirs, may express others imposed upon them by a peculiar environment. These new differences are not necessarily inherent in the germ plasm but are responses to the particular environment, and may persist as long as the environment remains consistent. Dry cultivation, wet cultivation, length of growing season, and temperature are a few of the modifying influences.

Varietal differences in rice are based on a number of distinctive characters. Stem, root, leaves, nodes, pigmentation, and size and shape of the grain are some of the outstanding characters used for diagnostic purposes.

The kernel is the important product of the plant and is the part used for classifying rice varieties in the United States. The simplest classification,

based on gross morphology, designates kernels of three major groups: round, medium, and long.

Considering the thousands of varieties grown in other parts of the world, comparatively few are grown in the United States. If representatives of all the rice varieties were examined separately, there would be no mistaking the identity of each one. Arrange the thousands of separate and distinct representatives in a single row, and their differences are dramatized: size, color, shape, ridges, presence or absence of awns. Yet all rice grains have a common basic structure.

Self-pollination is the most important botanical characteristic of the rice plant. This fact has often led to the belief that crosses do not occur in the field, except by other than natural means. The flower remains open for 2 to 3 hours and the stigma is thus exposed to pollen from near-by plants, carried by the wind or other sources. Hence cross-pollination does occur, in the ratio of 1 to 4%.

The so-called "wild rice" of Canada and the Great Lakes region of the United States is a wild aquatic plant, *Zizania acuatica*. It is highly prized as an accompaniment to wild game, particularly geese and ducks. So far, it is not grown under controlled conditions. Because of the plant's tolerance to water and marshy conditions it has been loosely, but not accurately, grouped with the rice family; in growth characteristics, however, it more closely resembles barley.

Cooking Quality and Practices

Jones (1) suggests a simple, rapid test for the culinary quality of rice which, with a little persistence, works out quite well. The test is based on the behavior of kernels under the influence of alkali. When milled rice grains of different varieties are immersed in a 2.38% solution of potassium hydroxide, the disintegration varies in nature with the variety, time, temperature, and size and shape of the kernels. The degree of disintegration is noted after 2, 6, and 24 hours. Variations in seasonal environmental conditions probably affect the character of starch in some varieties more than in others. Varieties of similar grain types, in which the kernel disintegrates into clear or intermediate masses, are generally accepted to be of better cooking quality than those that disintegrate into opaque masses. Varieties are classed as follows according to their manner of disintegration: *Clear masses:* Blue Rose, Zenith, Caloro, Colusa; *opaque masses:* Early Prolific, Edith, Lady Wright; *clear or intermediate:* Fortuna, Rexoro, Nira; *inconsistent:* Honduras.

Since most homes in Asia, Latin America, and Africa are without baking facilities, the largest share of the world's rice is consumed in the boiled form. Many methods are in use, from boiling in an open kettle over a rapid fire to steaming slowly in a covered container. Some prefer to use a little rice in a large volume of water; others use a large quantity of rice and very little water. Placing the rice in cold water from the beginning is one cooking procedure; another is pouring boiling water over the rice. Many let the rice boil rapidly in an open container until the grains swell, and then cover the kettle for the last few minutes to let the rice slowly steam. Still others cover the kettle at first, adding more water and removing the cover to finish the cooking.

It has been pointed out that washing rice before cooking removes all the excess bran adhering to the surface of the grains and, with it, much of the nutritive value. This practice is being discouraged. Pouring off the remaining liquid after cooking is another undesirable practice from a nutritive standpoint. It is suggested that only enough water be added so that there is no excess liquid at the end of the cooking period.

There is no general agreement on quality factors. In some parts of the world, long-grain rice is not liked. In Japan, Korea, and Puerto Rico the preference is for the round, short-grain types. The Japanese prefer this because it sticks together best, making it easier to handle in the preparation of their foods. White rice is not universally preferred. In some Indian communities, for instance, all white rice plants are carefully pulled out from the growing fields so that there will be a uniform stand of red, or purple, or blue rice. In the interior of Ecuador and in certain other areas of Latin America the population has consumed musty rice for so long that clean, sweet, white rice is rejected.

U. S. Rice-Producing Areas

A century ago rice was an important crop in North and South Carolina and Georgia, but when new areas in the Southwest were opened up after the Civil War these states dropped out of production. At present, there are only three important rice-producing sections in the United States, and the crop assumes importance in only four states: Texas, Louisiana, Arkansas, and California. (Beginning in 1949, Mississippi and Missouri were added to the group of Southern states.) Two producing areas, differing considerably in varieties grown and marketing methods, are commonly designated in the U.S. trade: 1) Louisiana-Texas-Arkansas and 2) California. Broad expanses of level land, impervious subsoil, and abundant supplies of inexpensive irrigation water — the requirements for profitable rice culture — restrict any large-scale shift from these producing areas.

Cultivating and Harvesting

Rice cultivation in California is of fairly recent origin. Its development has been phenomenal. From a start of 1,400 acres in 1912, steady progress has been made until in 1954 more than 500,000 acres were planted in the Sacramento and San Joaquin valleys, producing in excess of 12 million cwt. of rough rice. This rapid growth has been brought about only through mechanization, and today rice is the most highly mechanized crop of U.S. agriculture. Planting, fertilizing, and weeding by airplane are in practical use on a large scale. This, despite the fact that rice is not normally a highly mechanized crop. Indeed, for 90% of the world's crop all plowing, seeding, irrigating, weeding, and harvesting are done without mechanical equipment and with little more than the historic wooden plow and the pointed stick.

Since 1940 the harvesting of rice by combine has become common practice, with large self-propelled machines capable of cutting, threshing, and cleaning a swath 10 to 18 ft. wide at a speed of 2 to 6 miles per hour, harvesting 3,000 to 4,000 bu. per day. Since the optimum moisture for combining is too high for safe storage, drying methods had to be developed for the rough rice so harvested. Large mechanical dryers now reduce the moisture level to a safe 14% for storage.

Milling

Unlike most of the other grains produced in the U.S., the rough rice

Seeding of rice on water by airplane. The plane is heading away after dropping the seeds, which are hitting the water in the foreground. The pilot is guided by flagmen at each end of the field. Planes fly 20 to 40 feet above the water and strew seed in a path 16 to 20 feet wide. (Courtesy University of California College of Agriculture.)

grain as it comes from the farm is used almost entirely for two purposes only: a small portion of each crop is used to plant the following crop, and most of the remainder is milled for human consumption. Again unlike the other grains, very little rough rice is used for feeding or for commercial purposes, and practically none of it ever appears in the large terminal markets where other grains are concentrated. More than one-half of all the rice produced in the world never leaves the farm where it is produced but is consumed by farm families, who mill perhaps a week's supply at a time. There are no futures market quotations for rough rice.

Rough rice has a tough, siliceous hull and seven layers of bran. Completely milled rice has the hull, bran, and germ removed. There is always some breakage of kernels. We speak of the milling quality of rough rice as high when the breakage is small, and low when considerable breakage takes place. The value of rough rice is determined to a great extent by its milling quality; the miller can ask a higher price for whole milled grain than for broken milled rice.

After the bran and germs have been scoured off, broken kernels are separated from whole kernels. The largest broken kernels are called *second head* and the medium-sized ones are known as *screenings*. The finely broken pieces of kernels of milled rice have long been used almost exclusively for brewing purposes; thus they have acquired the name *brewer's milled rice*. These terms and others are discussed more fully later on.

When rice before milling contains weed seeds, chalky kernels, red rice, and damaged kernels, the greatest part of these defects appear in the second head, screenings, and brewer's rice, and not in the whole-grain separation. This happens simply because practically all of the weed seeds are smaller than whole grains of rice and compare in size with one of the separations of broken rice. In the separation process, each weed seed follows the flow of broken rice most nearly its size. Chalky kernels, red rice, and damaged kernels break much more easily than sound kernels and go into one of the separations of broken kernels.

Rice milling is the removal of successive portions of the grain beginning with the hull. In the most refined milling very little but the endosperm is left in the end product.

A surprisingly large percentage of the total rice crop of the world is still milled by the primitive method of repeated pounding with mallet or pestle in a mortar; the pounded grain is then poured from one tray to another to remove the hulls, chaff, bran, and germ fragments. This method has the advantage over modern methods of retaining a larger percentage of the nutrients of the grain, since most of the bran and germ are retained.

Modern rice mills, on the other hand, perform all the labor, starting with hulling and ending with sorting into grades. The rough rice passes through at least three units: 1) the scalper, to remove sticks, stones, etc.; 2) the bearders, to remove beards and stems; and 3) the cleaners (monitors), to remove blanks and any other sticks, stones, and foreign material that may be present.

Shelling, Hulling, and Bran Removal

From the cleaners, the flow of paddy[1] is so regulated as to assure a constant flow into the hulling machine. This consists of two disks of stone or cast iron, the opposed faces coated with a preparation of emery and cement. One disk is stationary and has a hole or passage through which the grain is fed; the other revolves.

The pressure of the revolving disk upon the ends of the grain causes the hulls to crack or split, releasing the kernel. Grains below average size pass through unhulled, and those above average size are broken. Hulls, dust, dirt, and other material are removed by a series of machines, screens, and aspirators, and the unhulled grains are screened out to be returned to the auxiliary stone.

Here we have one of those inconsistencies in which something is called what it is not: the "hullers" remove bran, not hulls, from rice. This equipment has been adapted from coffee hullers, and the name has stuck. The hulled or *brown* rice is fed to a grooved, tapering drum revolving concentrically within a cylinder and so spaced as to rub off the bran with as little kernel breakage as possible. Loosened bran and smaller kernel pieces pass through the huller screen and are later separated by aspiration and screening. The main product, which now is *milled rice*, is passed through a *brush*, which performs a further polishing job by removing the remainder of the innermost or aleurone layer and any adhering floury particles. The brushing equipment is a series of revolving rollers or drums covered with leather flaps, encased in fine wire mesh. The flaps brush the rice as it passes in a constant stream between the drum and the wire. The demands of some markets require an additional step: coating with sugar syrup and talc powder, followed by "trumbling"[2] to bring out a high shine.

Grading and Standards

In any crop, certain factors cause part of the crop to be of better quality than the rest. A portion is relatively free of objectionable features, and other segments are progressively lower in quality. Under U.S. standards for most farm products, cotton, grain, fruit, and vegetables are usually graded on a numerical basis; thus a U.S. No. 1 product of any kind is the best, No. 2 permits more defects than No. 1, and so on.

[1] Rice as received from the field.

[2] Trade term for the action that occurs in the Rice Trumbol, a horizontal revolving cylinder which tosses the grains over and over to polish the rice after it has been coated with glucose.

In rice, such factors as chalky kernels, red rice, and damaged kernels are counted and scored, as well as the number of weed seeds present. Color and general appearance are considered in grade designations. The U.S. Department of Agriculture maintains inspection facilities and provides inspection and sampling services at all important rice-shipping points, issuing certificates that truly reflect quality according to the U.S. Standards for Milled Rice. If the buyer and seller prefer, these certificates may show, rather than grade determination, one or several quality factors in the Standards.

Revised U.S. standards for rough, brown and milled rice were put into effect July 1, 1951. The principal revision is in the new standards for rough rice, which provide for 1) grading on the basis of estimated quantity and quality of milled rice that can be produced from a given lot of rough rice, 2) reducing the maximum moisture for rough rice from 15% to 14%, and 3) establishing a separate grade for rough rice exceeding 14% but under 18% moisture.

The revisions also set up national standards for rough and milled rice to replace the separate ones previously in effect for the Southern Belt and California. Other revisions eliminate a number of special grades for rough rice and generally clarify and simplify rice standards and tighten requirements.

Terminology

Rice can be divided into four main classes: 1) rough or paddy, 2) brown, 3) unpolished, and 4) milled.

Rough rice has 50% or more of kernels of *paddy*, or rice from which the hulls have not been removed. (This term is also applied to rice as received from the field.) *Clean* rice is that from which the hull has been removed, as distinguished from rough; this term covers all grades and classes other than rough.

Brown rice has more than 50% of kernels from which hulls only have been removed. Each class must contain more than 25% of whole kernels of brown rice of the designated class, and not more than 10% of rice of contrasting classes. The percentages of whole and broken kernels of a designated class in any lot of rice of such class must be greater than the percentage of kernels of any other class.

Unpolished milled rice is whole or broken kernels from which the hulls, a part of the germs, and the outer layers of bran, but not the inner layers, have been removed; contains not more than 10% of seeds or foreign material, either singly or combined.

Milled rice is whole or broken kernels from which the hulls and practically all of the germs and bran layers have been removed. During the process of milling the greater part of the pericarp and the aleurone layers, together with the germs (including the scutellum), are removed in the so-called first-break bran, which is the first important by-product. The by-product consisting of the inner seedcoat layer (along with some starchy material), obtained in the later stage of milling, is called *polish*.

Further classification distinguishes head rice, second head, screenings, brewer's milled, broken kernels, and mixed milled rice.

Head rice is the product of milling which, after the usual screening or sizing, consists of whole kernels of milled rice and not more than 4% of broken kernels of milled rice.

Second head milled rice contains not more than 25% of whole kernels, not more than 50% of broken kernels that will pass readily through a 6½/64 sieve,[3] and not more than 10% of broken kernels that will pass readily through a 6/64 sieve.

Screenings milled rice contains not more than 25% of whole kernels, but does not meet the kernel-size requirements for the class *second head;* it contains not more than 15% of broken kernels that will pass through a 5½/64 sieve.

Brewer's milled rice contains not more than 25% of whole kernels but more than 15% of broken kernels that will pass readily through a 5½/64 sieve.

Broken kernels are split kernels and those that are less than three-fourths of the length of whole kernels.

Under official U.S. Standards effective July 1, 1951, the following classes have been established for milled rice: Rexoro (including the variety known as Rexark); Patna, Blue Bonnet, Nira, Fortuna; Blue Rose (including Improved Blue Rose, Greater Blue Rose, Kamrose, and Arkrose); Magnolia, Zenith, Calrose, Early Prolific, Pearl, Mixed, Second head, Screenings, and Brewer's milled.

[3] Metal sieve 0.032-in. thick with round holes 6½/64 in. in diameter.

Except for the classes Mixed, Second head, Screenings, and Brewer's milled, each class must contain more than 25% of whole kernels of milled rice of the designated class and may contain not more than 10% of milled rice of contrasting classes; and the percentages of whole and broken kernels of a designated class in any lot of such rice must be greater than the percentage of kernels of any other class.

Mixed milled rice is any mixture of milled rice which, again, contains more than 25% of whole kernels of milled rice and more than 10% of rice of contrasting classes.

Composition

Very seldom does rice contain more than 8% protein; California rice averages between 5 and 6%. The main protein of rice is oryzenin, a glutelin soluble in dilute alkali; there are lesser amounts of a globulin and an albumin. Studies so far have disclosed no alcohol-soluble protein present.

Depending upon the type of rice, amino acid content varies. Kik (2) has shown that the amounts of tryptophan, arginine, and histidine in rice protein, in at least one variety, compare favorably with those in proteins of wheat or maize; cystine and lysine are found in lesser amounts. Like other cereals, rice remains poor in lysine.

Sreenivasan and Venkata Giri (3) have indicated that polished rice is digested more easily than unpolished, and that parboiling increases the rate of digestion to some extent. The bran from rice has an inhibiting action on amylases which tends to be greatest with the first bran layers and to decrease with subsequent layers. Proteins and ether extractives of bran have an inhibiting action on starch hydrolysis by amylases. These authors have shown that rice grains that have been stored for some time swell in cooking to about four times the original volume, whereas rice from freshly harvested paddy reaches not much more than twice that volume. They reason that this may be due to the starch-liquefying ferment and amylase of the seed, since inactivation of the enzyme during storage is followed by greater swelling capacity in cooking.

Glutinous Rice

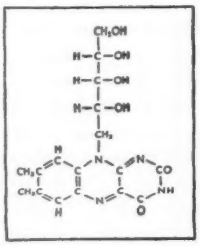
While genuine starch is found in both common and glutinous rices, it

The Vital Story

A Quick History. Independent investigators, working separately to unlock several of nature's doors, sometimes open up unsuspected relationships. This happened with vitamin B_2.

Investigations. About 25 years ago, several groups, notably Warburg's, were investigating a "yellow enzyme" obtained from yeast. Almost simultaneously other investigators were studying a food factor that aided growth of laboratory animals.

What they found. Proceeding with chemical analysis of this growth factor, the team of Kuhn, György, and Wagner-Jauregg noted a relationship between the growth-producing agent and the "yellow enzyme." Their findings, and those of other researchers along similar lines, were published in 1933. Eventually, riboflavin and an essential part of the yellow enzyme were found to be identical and the unity of an essential nutrient and cellular metabolism was established.



Isolation of pure riboflavin was achieved by Kuhn and his co-workers, and by Ellinger and Koschara, in 1933.

Nomenclature. Known in the United States as riboflavin, this vitamin has also been called lactoflavin, ovoflavin, hepatoflavin, and vitamin G.

SYNTHESIS

By 1935, two eminent chemists, working separately, had synthesized riboflavin, practically in a dead heat. Prof. Paul Karrer of the University of Zurich, a collaborator of the Hoffmann-La Roche Laboratories, produced the first successful synthesis. Five weeks later Richard Kuhn of Germany announced his synthesis of the vitamin. Prof. Karrer subsequently shared the Nobel Prize in Chemistry for his work in vitamins and carotenoids.

The Karrer synthesis forms the basis for chemical processes in widespread use today by Hoffmann-La Roche and other leading manufacturers throughout the world. Riboflavin is also manufactured today by fermentation methods.

CHEMICAL AND PHYSICAL PROPERTIES

Riboflavin is yellow, slightly water-soluble with a greenish fluorescence and a bitter taste. Its empirical formula is $C_{17}H_{20}N_4O_6$. Vitamin B_2 produced by the Roche process is identical in every way with that occurring in nature.

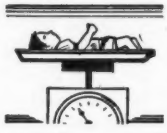
How does vitamin B_2 work? Riboflavin is a vital part of nature's chain of reactions for utilization of carbohydrate energy. It has been found to be a constituent of many enzyme systems and is thus intimately connected with life processes. It is probably required by the metabolic processes of every animal and bird as well as by many fishes, insects and lower forms of life. (In certain animals, however, the requirement may be synthesized by bacteria within the intestine.)

In the cells riboflavin goes to work attached to a phosphate group. This substance, known as riboflavin-5′-phosphate or flavin mononucleotide, may in turn be attached to still another essential substance, adenylic acid, forming flavin adenine dinucleotide. Either nucleotide then is attached to protein, thereby forming an enzyme, and takes its part in oxidation-reduction reactions.

Requirements in Human Nutrition. As we have seen, vitamin B_2 is essential to life. We have no special storage organs in our bodies for this vitamin, although a certain level is maintained in various tissues, with relatively large amounts found in the liver and kidneys.

MEASURING METHODS

In the beginning, riboflavin activity was described in "Bourquin-Sherman units" and requirements were thought to be very small. Subsequent research showed otherwise. Milligrams of weight became the unit and the Food & Drug Administration of the U. S. Dept. of Health, Education & Welfare established (July 1, 1958) a minimum daily requirement of 1.2 mg. of riboflavin for all persons 12 or more years old. For infants it is 0.6 mg. These requirements are designed to prevent the occurrence of symptoms of riboflavin deficiency disease. The minimum daily requirement for this vitamin for children from 1 to 12 years is 0.9 milligram.



Recommended allowances. The Food & Nutrition Board of the National Academy of Sciences—National Research Council, in its 1958 publication #589, recommends the following daily dietary allowances of riboflavin, expressed as milligrams. These are designed to maintain good nutrition of healthy persons in the U.S.A.

Men	1.8
Women	1.5
Women (pregnant; second half)	2.0
Women (lactating)	2.5
Infants (2 to 6 months)	0.5
Infants (7 to 12 months)	0.8
Children (1 to 3 years)	1.0
Children (4 to 6 years)	1.3
Children (7 to 9 years)	1.5
Children (10 to 12 years)	1.8

	Boys	Girls
Adolescents (13 to 15 years)	2.1	2.0
Adolescents (16 to 19 years)	2.5	1.9

# of VITAMIN B_2

(Riboflavin)

by Science Writer

Deficiencies of vitamin B_2 appear in several ways in human beings. The eyes, the skin, the nerves, and the blood show the effects of too little riboflavin. Laboratory animals have demonstrated that a riboflavin-deficient diet can cause death of adults and can slow or stop growth in the young. Female animals, deprived of riboflavin in the diet, may produce offspring with congenital malformations.

Medical uses. To overcome and control deficiencies in human beings, physicians have pure riboflavin available for administration by injection or orally, by itself or with other "B" vitamins or multi-vitamin-mineral combinations.

How do we get our daily riboflavin? Vitamin B_2 has wide distribution throughout the entire animal and vegetable kingdoms. Good sources are milk and its products, eggs, meats, legumes, green leaves and buds. Whole-grain cereals have significant but not large amounts of riboflavin.

ADDITION TO FOODS

Cereal foods play a large part in our diet. To produce the white flour almost all of us want, millers are obliged to remove parts of the wheat that contain much of the grain's riboflavin and other nutrients. In addition, cereal grains are not rich sources of riboflavin. Millers meet this problem by *enriching* the grain foods for which federal standards exist with vitamins B_1, B_2, niacin and the mineral iron. In the case of vitamin B_2, however, they do more than *restore* the processed food to its natural riboflavin level; they *fortify* the food with enough of this essential vitamin to make it nutritionally more valuable than it was in nature.

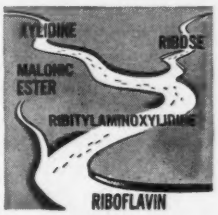
Acting to protect the good health of millions of Americans, bakers and millers adopted *enrichment* of white bread and white flour in 1941. Since that time, other foods, such as macaroni products, corn meal and grits, farina, pastina and breakfast cereals have had their food value increased by enrichment with pure riboflavin and other vitamins and minerals.

When enriching, fortifying or restoring, food manufacturers add the necessary quantity of riboflavin (and other vitamins and minerals) to the food during processing, so that the finished product meets federal, state, and territorial requirements or contributes to the consumer an amount of the vitamin that dietary experts believe significantly useful.

PRODUCTION

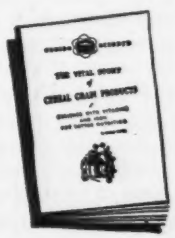
Prof. Karrer's synthesis of riboflavin was a laboratory success. Adapting the process to commercial production, however, demanded original thinking by chemists at Hoffmann-La Roche. The production of riboflavin by chemical synthesis requires the production of ribose, a rare sugar, at an early stage in the process. This special sugar must be made inexpensively if the synthesis is to be practical. Sugar chemistry is a difficult matter. In a brilliant piece of work, the Roche chemical experts developed a method to produce ribose on a commercial scale by an electrolytic process, thus overcoming a most troublesome problem. Subsequently, Roche chemists developed the first practical synthesis for riboflavin-5′-phosphate, identical with natural flavin mononucleotide.

Picture three streams joining to form a river and you have a simplified idea of the Roche process for synthesizing vitamin B_2. O-xylene and glucose are processed separately to form xylidine and ribose respectively. These are joined to form ribitylxylidine, which is then converted to ribitylaminoxylidine. Starting separately with malonic ester, which is processed through intermediate stages to alloxan, the third "stream" is then joined with ribitylaminoxylidine to form riboflavin. Purification occurs at each step of the synthesis. Riboflavin Roche* equals or exceeds U. S. P. standards.



By the tons. So efficient is the Roche process that pure riboflavin is produced *by the tons* for use in pharmaceutical products and processed foods. An interesting development by Roche is the production of riboflavin in different forms related to the method of end use. Roche*Regular riboflavin U. S. P. is especially useful in dry enrichment premixes, powdered dietary supplements, pharmaceutical tablets and soft gelatin capsules. Roche*Solutions type is preferred for the manufacture of solutions having low concentration. Roche* Riboflavin-5′-Phosphate Sodium is a highly and rapidly soluble riboflavin compound favored for all pharmaceutical liquid products and some tablets, lozenges, and capsules. It has a more pleasant taste than the bitter U. S. P. riboflavin.

This article is published in the interests of pharmaceutical manufacturers, and of food processors who make their good foods better using pure riboflavin Roche. *Reprints of this and others in the series will be supplied on request without charge. Also available without cost is a brochure describing the enrichment or fortification of cereal grain products with essential vitamins and minerals. These articles and the brochure have been found most helpful as sources of accurate information in brief form. Teachers especially find them useful in education. Regardless of your occupation, feel free to write for them. Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Ltd., 1956 Bourdon St., St. Laurent, P. Q.



displays different properties, depending upon its source. Glutinous rices have a chalky, opaque endosperm, the cut surface being described as paraffin-waxlike in appearance; ordinary rices have a vitreous endosperm. Starch from glutinous rice gives a reddish-brown color when treated with iodine, in contrast to the blue color reaction of nearly all starches. Because dextrin gives this same reddish-brown color, glutinous rice has sometimes been referred to as sweet or waxy rice. The starch characteristics of waxy or glutinous strains of sorghum, barley, millet, and corn are more like those of root crops.

Some glutinous rice is grown in the San Joaquin Valley in California. It is used mainly in Oriental ceremonial foods and in wafers that require a glutinous flour. Recent work at the Western Utilization Research and Development Division has shown that flour made from glutinous rice solves the problem of curdling in white sauces and gravies used in precooked frozen foods such as chicken a la king.

The theory has been advanced that the starch differences in glutinous and common rice are due to the physicochemical properties of their separate protoplasms and, in particular, to oryzenin, the main protein of rice. (Like nonglutinous rice, the glutinous type contains about 5 to 6% proteins.) A great many differences have been enumerated in the physicochemical properties of oryzenins of the two types. It has been pointed out that among the hundreds of varieties of common rice grown in Japan, only a few are considered suitable for the preparation of sake; specific differences in the oryzenins are said to account for the distinction.

Starch of glutinous and ordinary rice is identical as to grain size, microcrystalline structure, and birefringence. In glutinous rice swelling occurs at about 55°C., and at 65°C. the grains disintegrate to a turbid suspension which no longer has the properties of starch paste. The aqueous extract of glutinous rice produced at 50° to 70°C. gives a red to red-violet iodine reaction; there are no hydrosoluble parts which give a blue coloration, nor is there any slow separation of crystallized amylose, as with ordinary rice. Glutinous rice, then, contains very little amylose (actually less than 1%), but in its place there are strongly branched molecules of low and medium molecular weights, which fall between the types of ramification shown by amylopectin branched molecules and glycogen, respectively.

Parboiling

Parboiling of rice has commanded considerable attention among U.S. nutritionists during the past two decades. Parboiling, an ancient traditional practice in much of India and now done domestically in Houston and Sacramento, is essentially a process of steeping rough rice in warm to hot water, steaming, and drying to milling moisture. It probably was done originally to loosen the hulls and assist in their removal, but it also serves an excellent nutritional purpose. The water passing through the bran coats carries the soluble vitamins and minerals into the endosperm where they are largely retained after milling. Today's parboiling or "converting" is a modernized version of this process. While parboiled rice is in demand in India, it has not found the same general acceptance in other parts of the world. Whether this is due to some modification of color, flavor, or texture has not been determined. Nevertheless, it is safe to say that parboiled rice has secured a place for itself in our domestic rice economy, mainly as a ready-to-eat cereal, as canned rice, and as an ingredient in soups. With the recent appearance of precooked rices and the prospects for frozen cooked rice, per-capita consumption may rise beyond its present figure.

Enrichment in Puerto Rico

To the great majority of Puerto Ricans, the superior nutritive value of brown and parboiled rice means nothing and they demand their familiar white product. Because of this, legislation has been enacted which fixes and prescribes the nutritional elements that all rice sold in the country for human consumption must possess. Act No. 430, approved May 13, 1951, and effective January 1, 1952, specifies the content of vitamins and mineral per pound of rice given below (with a possible loss of not more than 15% of each):

	Brown	*Parboiled*	*Fortified*
	mg/lb	*mg/lb*	*mg/lb*
Thiamine	1.35	1.20	2.0
Riboflavin	0.30	0.15	....
Niacin	16.00	16.00	16.00
Iron	13.00	13.00	13.00

To accomplish this enrichment according to the Act and still satisfy the demands of consumers as to appearance of the rice, a concentrate of fortified white rice is prepared and added, in the necessary proportion, to the ordinary commercial rice. With special equipment installed for the purpose, the concentrate is prepared in this manner:

Milled white rice is wetted with the prescribed vitamins in acid solution, and then coated with a film of zein (a corn protein) and abietic acid (rosin) in alcohol solution. After this first film dries, a mixture of ferric pyrophosphate and talc powder is dusted on the mass and a second film of the same composition is applied. A final dusting with talc powder, followed by further "trumbling" and drying, completes the process.

The film prevents loss of vitamins when the rice is cooked according to local custom, and the fortified rice is not readily distinguishable, either raw or cooked, from white rice. The finished dried product is so highly fortified that 1 lb. of it mixed with 200 lb. of rice brings the nutrient level up to that of brown rice. Riboflavin is not included because it discolors the grains of concentrate; otherwise, the rice meets the levels required in the United States for enriched flour and corn meal.

Oil from Rice Bran

Other than head rice which averages about 60% of all rough rice, 40% can be considered by-products — hulls, bran, "polish," and the various grades of broken kernels. About 8.5% is the bran fraction, the bran and polish together amounting to about 10% of the rough rice and the hulls about 20%. The bran and polish are used as feed, being products of high nutritive value, rich in fatty materials, protein, and vitamins.

Once separated from the grain, the bran undergoes rapid splitting or hydrolysis; free fatty acids and glycerol are formed which can be considered detrimental to the use of the bran as stock feed. When these fatty acids are attacked by oxygen, fat peroxides and other oxidation products (such as are usually found in rancid fats and oils) are formed. Although not wholly indigestible, these products are undesirable because of their action on other ingredients in mixed feeds; they destroy fat-soluble vitamins and cause digestive disturbances.

Removal of the mixture of glyceride fats and fatty waxes from freshly milled rice bran effectively stabilizes the product and raises the nutritive value of the bran by increasing proportionally the content of proteins and other components. The oil is of considerably higher value than the bran from which it is recovered.

Two extraction plants in the U.S. are removing oil from rice bran by means of petroleum solvents (mixed hexanes): the Rice Growers' Association of California, in Sacramento; and Comet Rice Mills in Houston, Texas. These two plants produce annually more than 10 million lb. of crude rice bran oil. The oil has found good reception in the edible oil market, where its superior keeping qualities are recognized. Its use as a salad and cooking oil is growing. In the past, the product has been used as a sulfonated oil in the textile industry; currently it is undergoing scrutiny as a superior ingredient in rust-preventive compounds.

Probably the most outstanding characteristic of rice bran oil is its exceptional stability after hydrogenation. Tests have shown that the stabilities of these oils when refined, bleached, and deodorized, and of the hydrogenated products made from them, are approximately twice those of comparable commercially acceptable vegetable fats.

Table I compares rice bran oil with two other oils as to analysis and characteristics after refining.

Table I. Composition and Other Characteristics of Rice Bran Oil vs. Commercial Oils

	Rice Bran	*Peanut*	*Cottonseed*
ANALYSIS OF CRUDE OIL:			
Fatty acids, %			
Saturated	17.6	20.0	24.0
Oleic	47.6	50.0	24.6
Linoleic	34.0	30.0	51.0
Linolenic	0.8	0.0	0.0
Iodine value	102.3	95.0	109.2
Unsaponifiable matter, %	2.7	0.5	0.5
CHARACTERISTICS AFTER REFINING AND BLEACHING:			
Smoke point (°F.)[a]	415	445	425
Flash point (°F.)[a]	615	625	613
Fire point (°F.)	665	680	683
Cloud point (°F.)[b]	34	40	38
Solid point (°F.)[b]	18	34	28
CHARACTERISTICS AFTER REFINING, BLEACHING, AND WINTERIZING:			
Cold test, hours[a]	9	....	5–15
Cloud point (°F.)[b]	20	....	24–26
Pour point (°F.)[b]	18	....	20–22

[a] A.O.C.S.
[b] A.S.T.M.

Hulls and Their Uses

A word or two on hulls, the outermost layer of the grain and quite different from bran and polish in structure and composition. Hulls run about 20% ash, of which about 92% is silica (an extremely high figure for a vegetable material) and the rest is lime (2.25%), potassium oxide (3.15%), and varying amounts of aluminum, boron, copper, iron, manganese, phosphorus, sodium, and tin.

Because of its peculiar gridlike structure, the hull is remarkably rigid, has a high insulating value, burns very reluctantly, and is extremely abrasive. The cellulose content when freed of other components is of high quality, but the fiber is short and does not felt well. Some encouraging results have been reported in the production of alpha-cellulose with a low silica content. The pentosan content of hulls has been extracted by acid hydrolysis and is used occasionally for furfural. However, rice hulls contain a smaller amount of pentosans than oat hulls and corncobs.

Hulls have different apparent densities; of California rice, 7.25 lb. per cu. ft.; of Southern, 6.25 lb.; averaging 7 lb. or occupying 300 cu. ft. to the ton. Northern Utilization Research and Development Division reports solubilities to be 7.8% in hot water, 3.5% in alcohol, benzene, or acetone, and 45.2% in 1% sodium hydroxide solution; neutral pH in water (pH 5 to 6); caloric value 6.274 Btu. per lb., about half as much as bituminous coal or one-third as much as California fuel oil.

In California, rice hulls are used in minor volume as a soil conditioner. The ash of burned hulls is usable: the gray ash from the outside of the burned-out pile as a grease-absorbing sweeping compound; and the pink ash, from the inside of the pile, as an abrasive in hand soap.

Rice in Brewing

The use of rice in brewing began in this country in the 1880's when some American breweries set out to expand their sales from local to national. Until that time beer was distributed in kegs and consumed promptly. For distribution in bottles over a wide area, however, the beer had to retain its taste and quality for a comparatively long time. To accomplish this, improvement of the shelf-life of bottled beer became imperative, and brewers learned that a starch adjunct was necessary to impart stability. Although any starch would serve that purpose, some starches give a characteristic taste to the beer and are therefore undesirable. It was found that rice was the most suitable adjunct, and brewers began buying the smallest size of broken rice from millers. Thus began the classification *brewer's rice*. Since the amount of this size produced is not sufficient, the class of broken rice slightly larger, or *screenings*, augments the supply for beermaking. From 152,546,000 lb. of rice used for this purpose in the U.S. in 1943, the amount has now more than doubled.

The strong advance of national beer shippers at the expense of regional and local brewmakers points up the success of adjuncts, and is most sharply defined in the relationship between sales of packaged beer and those of draught beer. In 1934, draught beer accounted for 75% of total production and packaged beer 25%. By 1939 the two groups had almost equalized at 50.7 and 49.3% of the total, respectively. From then on packaged beer maintained a steady and consistent rise until by 1951 it reached about 75% of the total. Twenty-five leading brewers, doing 41.5% of the total business in 1941, advanced the percentage to 57.7 by 1951.

Some breweries use broken rice just as it comes from the mills; others granulate it themselves; still others prefer to have the mills do the granulating to their specifications.

In preparation for the brewing mash, rice is boiled for about 20 minutes in a mixture with water and about 10% of the malt. After the de-

sired degree of liquefaction has been reached, this cereal mash is combined with the main mash, where the enzymes of the barley malt convert the starches to maltose sugar; the hops are added, and it then becomes the brewing mash. One hundred pounds of brewer's rice will "yield" about 80% of usable carbohydrate mixture.

Weed seeds and other extraneous matter in the rice must be held at a minimum because they directly affect the yield of carbohydrate mixture. Along with color and general appearance, the amount of weed seeds in brewer's rice is a factor used in determining grade, of which there are four.

Approximately 15 lb. of adjuncts are used in each 31-gal. barrel of beer. Other adjuncts are corn, sugar and syrups, and wheat.

Rice Economy

Between 1945 and 1955, world supplies of rice were scarce and prices rose steadily. Shortages were caused by wartime and postwar disruptions which reduced output in important rice-producing countries. U.S. rice production before World War II was less than 25 million cwt., but during and after the war it rose rapidly and continued to build until it reached 64 million cwt. in 1954. Though large in comparison with that of a decade earlier, our 1958 production represented only about 1% of the world total.

The world shortage began to ease in 1953 as export supplies became more abundant. Unusually favorable growing conditions and expanded acreage, both in importing and exporting countries, improved the supply situation. By the fall of 1953, prices in world trade began to move downward from record levels.

Stocks in the United States started building up in 1953-54 following the record 1953 crop, and at the beginning of the 1954-55 marketing year the carry-over was 7.5 million cwt. The combination of these carry-over stocks, another record 1954 crop, and lower exports caused the August 1955 carry-over to rise sharply, to about 26.7 million cwt.

In view of this heavy accumulation of rice, acreage allotments and marketing quotas were set for 1955 and approved in referendum. The consequent sharp reduction in acreage was offset by a substantially higher yield per acre, boosting 1955 production to the second highest up to that date. Higher domestic consumption was not sufficient to keep down the accumulation, and carry-over stocks on August 1, 1956, reached the record level of 34.6 million cwt. Marketing quotas again were set for the 1957 crop.

Although the carry-over on August 1, 1957, was cut to 20.1 million cwt. by a smaller crop and record exports, supplies continued large and quotas were again necessary for the 1957 crop. Even though exports were less than half those of a year earlier, stocks on August 1, 1958, were reduced by another 2 million cwt. to 18.1 million by a further decline in production resulting from the Acreage Reserve Program.

U.S. Rice Exports

	million cwt.
1952–53	25.1
1953–54	22.7
1954–55	14.3
1955–56	18.7
1956–57	37.7
1957–58	18.3

1958 Rice Production

U.S. rice production in 1958 was estimated as of December 1 at 47,038,000 cwt., 10% above last year's small crop, and about equal to the 10-year average. The higher production for that year was due to both higher yields and larger harvested acreage, the latter accounting for two-thirds of the increase. The yield of 33.09 cwt. per harvested acre was only slightly above that of last year. (See Table II.)

United States Exports of Milled Rice, 1957-58

(In Thousands of Cwt.)

WESTERN HEMISPHERE		ASIA	
Canada	293	Ceylon	331
British Honduras	24	Indo-China	1
British West Indies	103	Indonesia	753
Cuba	4,246	Japan	5
Guatemala	68	Korea (Republic)	242
Haiti	14	Pakistan	3,452
Netherlands Antilles	54	Philippines	554
Bolivia	44	Saudi Arabia	151
Peru	980	Other countries	134
Venezuela	2	Total	5,623
Other countries	67		
Total	5,895	Oceania	52
		Liberia	270
EUROPE		Other Africa	24
Belgium-Luxembourg	76	Destination not specified	17
West Germany	30	Total	363
Netherlands	14		
Switzerland	32	Total Western Hemisphere, Europe, Asia	12,108
Other countries	75	Section 416 shipments	683
Total	227	World Total	12,791

Domestic use (including shipments to U.S. Territories) rose from 20 million cwt. in 1946–47 to 29 million in 1955–56. More of this increase was in brewer's rice and for seed and feed than for food, but a rise in per-capita consumption, as well as in population, brought food use up from a below-average level. Use by brewers and for feed went down in 1956–57 and 1957–58.

Exports accounted for about half the 1951–55 production. By 1952–53 they reached a record level, then fell and rose again to a still higher record, and dropped once more (see table below). The boxed table shows U.S. exports, on a milled basis, by countries of destination for 1957–58.

A record high average yield of 32.5 cwt. per harvested acre was obtained in Arkansas, and yields in Texas and Missouri were second only to last year's record. The crop in the major Southern producing states — Texas, Louisiana, Arkansas, Mississippi, and Missouri — was estimated at 35.3 million cwt. (33.2 million the previous year). Heavy applications of fertilizer and favorable growing weather were responsible for the high yields. Milling quality is reported to be unusually good.

In California, production is estimated at 11,730,000 cwt., with a record yield of 46.0 cwt. per harvested acre. Very favorable weather gave excellent conditions for combining,

and little loss was experienced. Quality was generally lower than usual.

Production in the minor rice-producing states — Arizona, Florida, Illinois, North Carolina, South Carolina, Oklahoma, and Tennessee — totaled about 23,000 cwt. or 3,000 cwt. above 1957.

shipped well over the 1957 volume, whereas Western Hemisphere exports were down, principally in the United States.

Two significant points are to be noted in 1958 trade: 1) Increases in exports have been largely in those areas marketing short-grain varieties

Table II. Crop Report on Rice, December 1958
(Source: Crop Reporting Board)

	Average Acreage Harvested (In 1000's of acres)			*Average Yield per Acre (In pounds)*			*Average Production (In 1000's of bags[a])*		
	1947–56	*1957*	*1958*	*1947–56*	*1957*	*1958*	*1947–56*	*1957*	*1958*
Missouri	3[b]	3.9	3.7	2,591[b]	3,200	3,100	89[b]	129	115
Mississippi	38[b]	31	39	2,631[b]	3,200	2,800	994[b]	992	1,092
Arkansas	442	332	336	2,403	3,100	3,250	10,616	10,292	10,920
Louisiana	589	400	408	2,107	2,675	2,750	12,270	10,700	11,220
Texas	524	347	379	2,462	3,200	3,150	12,863	11,104	11,938
California	323	226	255	3,251	4,300	4,600	10,361	9,718	11,730
U.S.	1,911	1,339.9	1,420.7	2,405	3,204	3,309	46,975	42,935	47,013

[a] Bags of 100 lb.
[b] Short-time average.

The world rice crop in 1958–59 will far exceed any previous harvest. It is estimated in the first forecast at 471 billion pounds of rough rice (425 billion in 1957–58). Average production from 1950–51 through 1954–55 was 394 billion pounds. Excluding the Communist areas of Asia, world production is now estimated at 282 billion pounds of rough rice (266 billion in 1957–58). This is 11% above the average of 1950–51 through 1954–55.

World acreage in rice is at a record level, up on all continents except Africa. The estimated acreage of mainland China, leading producer, is sharply above that of the preceding 3 years. In other countries, acreage is nearly 2 million above the previous record of 2 years ago.

1958 World Trade

Preliminary figures indicate that 1958 world trade in rice was at or above 1957 levels. The beginning of 1958 saw considerable apprehension throughout the world as to the amounts of rice available for export. As the year moved along, however, estimates proved to be low and supplies were adequate to meet effective demand.

Exports from Indo-China, Taiwan, and mainland China, particularly the latter, were up materially. Supplies were materially down, however, in Burma and Thailand owing to below-average crops, with the reduction largely centered in the lower range of grades. Italy, Spain, and Egypt (Japonica or Pearl) — Taiwan, Italy, Spain, Egypt, and mainland China; and 2) exports of both long- and short-grain rice from mainland China rose rapidly and were shipped to more countries. Worldwide consumer demand continued its slow rise for the third year, reflecting slightly better economic conditions in some deficit areas, together with steadily increasing needs because of rising population. The effective demand for rice is expected to remain relatively high in 1959. Foreign exchange available to many deficit areas is still insufficient for them to obtain enough rice through the channels of trade to maintain consumption per person at 1935–39 levels. A substantial part of such requirements will have to continue to be supplied under various types of concessional sales and aid programs, or with cheaper but less-preferred cereals.

Per-Capita Consumption of Rice

Consumption of rice in continental U.S. in 1957–58 was 5.7 lb. per capita, down slightly from the 5.8 lb. the year before. However, through the promotional work of the rice industry and the distribution of CCC stocks to school and welfare institutions, per-capita consumption is about 8% above the 5.3-lb. average in 1946–47 to 1955–56.

Per-capita consumption is expected in 1958–59 to be little if any different from the 5.7 lb. in 1957–58. With the increase in population, total consumption of milled rice for food is expected to amount to about 980 million lb., the highest since the postwar year 1919.

The amount of rice consumed annually in China and India is unknown, but it is very large; in Japan it is about 375 to 400 lb.; in Puerto Rico 136 lb., and in Hawaii 92 lb. The United States average is 5.7 lb., ranging from a low of 0.8 lb. in New Hampshire to Louisiana's 37.1 lb. In between are California's 7.7, Florida's 11, and South Carolina's 26.5 lb. Six states — New York, Louisiana, California, South Carolina, Florida, and Texas — account for about 59% of the total distribution of rice for direct food use; they have about 28% of the population. Seventeen states use less than 2 lb. per person annually — about a teaspoonful per day.

Energy Yield

Approximately 95% of this important crop is produced in the Asiatic orbit of India, China, Japan, the Philippines, Burma, Korea, Thailand, Indo-China, and other sections of Southeast Asia. There is good reason for the heavy accent on rice as a food in these heavily populated areas.

The daily intake of foodstuffs at all seasons of the year must meet not only the total energy requirements of the individual but also his requirements of the various protective food factors. The first requisite is that energy needs should be supplied. At the same time, energy-giving foods are not sufficient by themselves unless the accessory food factors are also present.

There are very striking differences in per-acre energy yield under different forms of cultivation. That of animal products, for instance, is low. It is estimated that in the United States, although only about 40% of the energy value of the diet is derived from animal products (meat, milk, poultry, and eggs), nearly three-quarters of the crop land is used for their production and almost all of the pasturage. A substantial part of the diet is thus made up of elements which, though of high nutritional value in other respects, are low in terms of per-acre energy yield.

Cereals, on the other hand, have a high per-acre energy value, and of all cereals rice has the highest yield on a world-wide basis. It has been found that, taking in each case an average yield on soil suitable for the crop, a great deal more food, meas-

ured by caloric value, can be produced from one acre of rice than from an acre of any other cereal. When a cereal or other feed is converted into meat or milk, though there is an accession of other factors, there is extensive loss of energy. These considerations are of importance where population is high relative to the agricultural land available, and where imported foodstuffs can do little or nothing to supplement local production. At the same time energy by itself is, of course, not enough. Other things being equal, the crop which has the most protective food factors in addition to high energy yield is to be preferred over that which gives little besides energy.

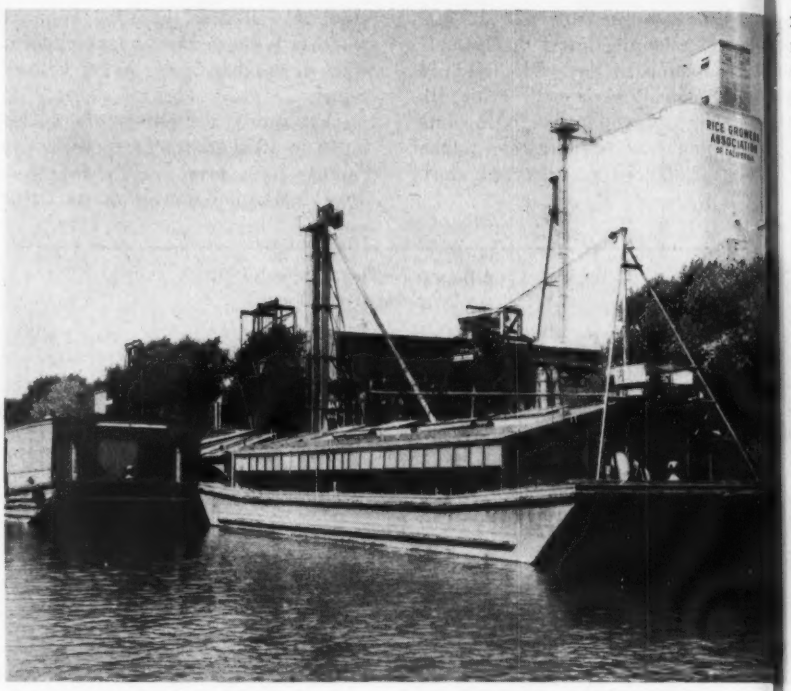
It is generally conceded that food of two or three times the energy value per acre can be produced in the form of rice as compared with wheat. This holds good for rice as against wheat in China itself, and for rice production in China as against wheat production in the United States. Assuming a milling yield of 65% and a caloric value for rice of 1,600 per lb., a yield of 3,000 lb. per acre produces almost 5 million calories per acre per year. It would be difficult to equal this production over so large an area in any other form of food.

Domestic Distribution Pattern

In a survey showing domestic distribution of milled rice in continental U.S. in 1955–56, direct food use accounted for 8,117,600 cwt., and processed food use, 1,506,900 cwt. Of the former, 53.5% was of the long-grain type, 38.2% of medium-grain, and 8.3% of short-grain. Table III shows the domestic distribution of milled rice for use in processing by type of product.

Shipments to U.S. Territories

Milled rice shipped to U.S. Territories August 1, 1955, to July 31, 1956, totaled 3,566,000 cwt. Of this, 86% went to Puerto Rico, 13.5% to Hawaii, and the remainder, 0.5%, to the Virgin Islands and Alaska. On a per-capita basis, the distribution of rice in Puerto Rico was 136.1 lb. Hawaii and the Virgin Islands, with 91.6 and 65.0 lb. per capita, respectively, were also high compared to the mainland. Of shipments to the Territories, 0.6% was of the long-grain type, 32.8% medium grain, and 66.6% short-grain.



Barges at Sacramento for conveying milled rice to Stockton or San Francisco where it will be transferred to an oceangoing vessel.

Household Consumption

Findings of a survey of household food consumption in the U.S. in a week in the spring of 1955 indicate that the use of rice per person in households of two or more persons decreased sharply as incomes increased to the $4–5,000 group. Only small variations appeared to be indicated for incomes up through the $6–8,000 class.

Consumption per person in all urban and farm households of two or more persons was 0.11 lb. The rural nonfarm rate was 0.1 lb. Highest consumption per person was in the lowest income group in each urbanization class. In this income group, urban consumption was highest, rural nonfarm second, and farm lowest. In each type of urbanization, consumption in households of two or more persons fell off sharply in the $4–5,000 group. In the $5–6,000, $6–8,000, and $8–10,000 income groups, consumption of all rice per person held up fairly well in the farm and urban classes, but fell off as income increased in the rural nonfarm class. On the other hand, rice breakfast food alone appeared to gain favor with rise of income. The highest income group is made up of relatively few cases and thus represents a wide range of income; accordingly, no great significance should be placed on this portion of the survey.

Consumption of rice per person (all households) for one week, in the form of breakfast food as well as general use, was heaviest in the Southern region (0.18 lb.); the Western region was next (0.09 lb.), then Northeast (0.08 lb.), and North-central (0.06 lb.). While urban consumption per person leads in the Southern

Table III. Domestic Distribution of Milled Rice for Use in Processing, by Type of Product, August 1, 1955, to July 31, 1956[a]

Type of Rice	*Cereal*	*Soup*	*Canned Rice and Baby Food*	*Other*[a]	*Total*	*Percentage of Total*
	1000 cwt	*1000 cwt*	*1000 cwt*	*1000 cwt*	*1000 cwt*	*%*
Milled rice						
Long-grain	5.4	95.4	70.5	11.1	182.4	12.1
Medium-grain	808.1	5.9	25.3	4.3	843.6	56.0
Short-grain	455.5	0.0	7.9	0.0	463.4	30.8
Unclassified	0.0	0.0	17.5	0.0	17.5	1.1
Total	1,269.0	101.3	121.2	15.4	1,506.9	100.0

[a] Brewer's rice excluded.

region, farm and rural nonfarm was relatively heavy. In the Northeast urban was heaviest. The three groups did not vary greatly in the North-central and Western regions.

Research

Research continues to occupy the attention of a large number of investigators, federal, state, and local, in collaboration with the rice industry. The Agricultural Research Service, USDA, conducts rice research in storage, product development, and the fundamental chemistry of the rice grain, at two of its Utilization Research and Development divisions—the Western at Albany, California, and the Southern at New Orleans, Louisiana.

Each year the Rice Research and Marketing Advisory Committee (composed of nine representatives from the industry) recommends to the USDA just which phases of research and marketing it wishes explored, and lists priorities. The USDA Agricultural Research Service in this way learns the wishes of the rice industry and can be guided in its studies.

The latest report made by the Advisory Committee listed the following "Recommendations for new and expanded work":

General:

Control of the new virus disease *Hoja blanca*

Rice genetics, breeding, and improvement

Weed control

Physiological studies

Insecticide residues

Management of basic soil and water resources

Economic evaluation of rice-farming systems

Biological control of rice insects

Utilization research:

Chemical composition and physical structure and properties of rice

Rice as a basis for industrial products

New rice food products

Effect of aging on rice

Objective measurement of processing and product quality

Stabilizing and improving brown, undermilled, and processed rices

Rice products as feedstuffs

Modification of rice by irradiation

Home economics:

Physiological availability of nutrients from rice

Marketing research:

Consumer use of and attitudes toward rice and rice products

Market evaluation of rice and rice by-products in industrial uses and selected institutional food uses

Insects in stored rice

Distribution pattern for rice

Maintenance of quality during commercial storage

Objective measurement of market quality

Marketing service and education work:

Foreign marketing services and related research; increasing rice markets

Educational work of the cooperative extension service: consumer information; market outlook and development; drying, storage, and insect control; expanded use of rice grades

On the state level the various rice-producing states maintain agricultural experiment stations where most of the research work on rice is done, in collaboration with or directed by the state universities. The research studies are in the general fields of agronomy, agricultural engineering, entomology, plant pathology, nematology, and animal industry. Most of this work is done in cooperation with the USDA and the rice industry of the state concerned.

In addition, many mills maintain laboratory staffs engaged in various investigations affecting their own operations as well as maintaining quality in outbound shipments.

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Steen:

(Continued from page 130)

may be as a cereal chemist, I appeal to your sense of identification with and loyalty to the cereal industries to ask that you make yourselves better acquainted with the separate but correlated programs of wheat growers, millers, bakers, and cereal manufacturers. I am sure the more you know, the more you will be impressed. And the more you know, the more you will be stimulated with ideas, suggestions, comments; the more you will gain enthusiasm for your own future and that of your own organization as you are rewarded by a share in the success of the industry campaign. Not only will we all gain with the greater security of working in an expanding industry: we cannot help but enjoy the added prestige and self-satisfaction that always comes with the knowledge that what you do contributes to the public good.

Such are the opportunities and the rewards in nutrition education.

LAST CHANCE

to make your experience immediately helpful to other cereal chemists. Send in your suggestions for revisions, omissions, and additions that should be made in the 7th Edition of Cereal Laboratory Methods. Send your comments to: M. M. MacMasters, 1815 N. University St., Peoria, Illinois.

People, Products, Patter

• • • People

Francis A. Baldauski appointed technical sales representative for Sterwin Chemicals, Inc. to work in

New York City area including Westchester County, Long Island, and parts of New Jersey. He was with Sheffield Chemical Division of National Dairy Products Corp. from 1947 to 1957; immediately prior to joining Sterwin, was development chemist for Nopco Chemical Co.

Tom S. Boyd, flour sales manager for the Commander-Larrabee division of Archer-Daniels-Midland Co., died April 15.

James W. Evans, director of research labs of American Maize-Products, elected vp in charge of research.

Stan Hadley has completed 25 years of service with Robin Hood Flour Mills, Ltd., at Humberstone, Ontario.

Harold J. Haney joins staff of National Dairy Research Center in Glenview, Ill.; was formerly with The Pillsbury Co. in their Springfield, Ill., plant.

C. G. Harrel retires as director of new product ideas department, The Pillsbury Co., after nearly 30 years with the company. He will keep in with the food industry as consultant, opening a Minneapolis office.

Mervin J. Kelly begins service as consultant to Bausch & Lomb Optical Co. after retirement on March

1 as chairman of board, Bell Telephone Laboratories, Inc. Has been a member of Bausch & Lomb board of directors since 1956. His career with Bell Telephone begain in 1918, as research physicist.

R. Newton Laughlin, president of Continental Baking Co., reelected to board of directors for three years. Also reelected for the same term were **Allen B. Morgan, Brayton Campbell,** and **Ralph Owen.**

M. C. Markley spent a month in Manila, P.I., as consultant for Republic Flour Mills, Inc.; will go to San Pedro Sula, Honduras, on a similar assignment.

Jack Monier has returned to Buffalo from Caracas, Venezuela, where he supervised the quality of Gold Medal flour produced there.

Arch Payne elected assistant vp of Florasynth Laboratories, Inc.; will retain position as general sales manager, held since 1947.

George P. Peeters, of Antwerp, Belgium, attended the Third AACC Sanitation Training School at the American Institute of Baking in Chicago, during the week of April 12-17. Dr. Peeters is director of Research, Cereal Division, of Cenatra, National Center for Technical Assistance and Applied Research.

I. S. Riggs, vp of Quaker Oats Co., spoke to the Northwest Feed Mfrs. Association in Minneapolis on April 21, discussing feed industry problems. He is board chairman, American Feed Mfrs. Association.

H. E. Robinson, director of laboratories at Swift & Co., Chicago, has been elected vp in charge of the company's scientific research activities. He has been with the Swift research staff since 1932 and has held various executive positions. He succeeds **Roy C. Newton,** retired.

David R. Ross, vp, heads new administrative department of Nutrena Mills, Inc. (subsidiary of Cargill, Inc.), supervising regional offices. **J. D. Armstrong,** vp, manages northern regional office. **Ralph V. Grier** will direct sales operations. **Warren E. Engelland** is northern regional sales manager. **Henry R. Patton** becomes sales training manager. Feed plants and production under **D. V. McDonald,** vp and director of manufacturing, will be supervised by regional production managers, including **M. M. Noxon** for the north region.

Frederic R. Senti appointed director of USDA's utilization research laboratories at Peoria, Ill. He succeeds **W. Dayton Maclay,** now assistant administrator of Agricultural Research Service, in which the Peoria laboratories make up the Northern Utilization Research and Development Division. Dr. Senti has made major contributions to the basic chemical knowledge of proteins and starches of cereal grains and the fatty acids of oilseeds.

L. T. Spence named products manager of medicated feed supplements for Merck & Co., Inc., Chemical Division; **H. S. Stockwell** is products manager for Merck nutritional items.

• • • Products

Tester for moisture or volatiles. A new Rapid Moisture/Volatiles Tester manufactured by C. W. Brabender Instruments, Inc., for reading moisture or volatile content has semiautomatic operation, eliminating the need for double weighing, desiccator cooling, and calculating. The announcement says it can be operated by unskilled personnel, with an accuracy of ±0.05%. The tester is said to increase speed and accuracy through updraft baffle heat and magnetic damping features. Ten-gram samples are weighed in special pans and, after any given drying period, moisture percentages may be read directly from the scale. Ten sample trays allow a series of samples from various parts of the batch to be averaged. Typical applications are: rate of drying studies to establish curves for facilitating process and quality control; optimum time-temperature drying conditions; stability testing of ingredients and additives used in

compounds; moisture testing to determine the need for drying of compounds in plastics molding. For complete information and specifications, write: C. W. Brabender Instruments, Inc., South Hackensack, N. J.

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Moisture analysis. If your product contains moisture, you may be interested in information regarding the Schlumberger Model 104 Nuclear Magnetic Resonance (NMR) Analyzer. A recent folder compactly outlines ways of reducing cost, improving quality, and increasing profit and contains concise economic data with charts; a product data sheet; and a blank you may fill out for analyzing your own requirements in moisture analysis, to be folded and mailed to the company for further information, postage paid by addressee. Write to Schlumberger, P.O. Box 550, Ridgefield, Conn.

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Sodium phosphates. Monsanto Chemical Co. offers a revised comprehensive technical bulletin and reference guide covering uses of its many sodium phosphate products. Physical and chemical properties are described and applications are outlined, such as phosphates in the manufacture of soap and detergents, both household and industrial, and for the food industry; textile processing; water treatment; and mineral supplements for livestock. Sodium phosphates as deflocculating and buffering agents are also covered. Copies available free from: Inorganic Chemicals Division, Monsanto Chemical Co., 800 N. Lindbergh Blvd., St. Louis 66, Mo.

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Wheat starch. Starbake® 100 Powdered, a premium food-grade wheat starch, is described in a product data sheet available from Huron Milling Division, Hercules Powder Co., Wilmington 99, Delaware. Starbake is said to be free-flowing and uniform, easy to blend with other ingredients, and to handle well in all mixing operations. Typical uses cited are angel-food and other foam-type cakes; pie crust, pie fillings; cake, pudding, and pie mixes; pancake and waffle batters and mixes; soups, gravies, and other thickened sauces; and as a replacement for other starches used for thickening food products. Advantages pointed out for it as compared to corn starch are its property of beginning to gelatinize more rapidly, and better appearance and color imparted to gels. Typical properties are included in the data sheet.

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Bread ingredient. Atmul 500, a smooth, white "mono" ingredient for all yeast-raised baked goods, has been developed by the food industry department of Atlas Powder Co. Aims for it are to help bread retain its freshness and to give finer, more uniform grain and smoother texture. Through efforts to identify and isolate the factor in softeners responsible for open grain, poor texture, sagging side walls, and low volume, Atlas cereal chemists have developed **"cell wall control"**; with this factor, the announcement reports, gluten can stretch and extend to the thinnest possible cell walls which are strong enough to contain fermentation gases. Atmul 500 may be added at the sponge or dough stage; needs no premixing or blending with other materials. Changes in formulation or fermentation time are unnecessary. For technical data or samples, write to the distributor, R. T. Vanderbilt Co., Inc., 230 Park Ave., New York 17, N. Y.

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Laboratory instruments. Two attractive booklets have just been issued by E. H. Sargent & Co., designers and manufacturers of laboratory instruments. Bulletin R describes in detail the operations and applications of the Sargent Laboratory Recorder, which measures current and voltage and all other quantities which can be transposed into potential or current signals.

Booklet 59 is an illustrated, fully up-to-date catalog of Sargent instruments. The company offers its assurance that development and manufacture by its engineering and design staffs have been under the most rigid standards, and that latest designs and applications have been incorporated.

For your copy of either or both, write to E. H. Sargent & Co., 4647 W. Foster Ave., Chicago 30, Ill. (Bulletin R, Dept. BSR; Booklet 59, Dept. 59.)

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Laboratory equipment: LaPine Apparatus Review 9 (16 pages) introduces new items such as automatic pipet control; dial-weighing torsion balances; gelation timer; 25-microscope-slide box of polystyrene; set-up support; angle-type framework foot; moisture determination balance; cylindrical oven; flash-evaporators, including portable models; Thermistor temperature controllers and thermometers; and many other items, including stirrers, wrap-around heater, low-cost oven, and small laboratory apparatus. For a copy write to Arthur S. LaPine & Co., 6001 S. Knox Ave., Chicago 29, Ill.

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Coconut flavoring. Many synthetic coconut flavors are far removed from the true character of their natural prototype and could easily stand improvement. Cocotone, a Givaudan flavor, is a liquid compound representing a scientific blending of ethyl laurate and other esters into a powerful flavor having at least twice the strength of 6-methyl coumarin. It is described as a very stable product even under high processing temperatures and therefore of particular interest to extract manufacturers and to the baking industry. Cocotone is recommended by Givaudan Flavors, Inc., primarily for use in preparing coconut flavors. Their flavorists have found that the addition of ¾ oz. Cocotone for each 4 oz. of aldehyde C-18 (prunolide) contained in the formulation will enhance the finished flavor and give it the nutty, meaty character which is so desirable; it will also assure flavor stability. Samples are available on request; Givaudan Flavors, Inc., 321 W. 44th St., New York 36, N. Y.

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Microscope slides for sanitation analysis. A much-needed service has been initiated by Kenton L. Harris and O'Dean L. Kurtz, to provide microscope slides of insect fragments, plus rodent hair and mold fragments, for reference in sanitation analysis in the food industry. Wherever there are insects in raw materials or in the processing plant, there will be insect frag-

Kenton L. Harris

O'Dean L. Kurtz

ments in the finished product; rodent pellets and hairs also leave fragments, and spoiled fruit makes for ground-up mold filaments. Realizing that materials for dependable basic training and reference are necessary if independent company laboratories are to cope with the problem of recognizing these contaminants, Harris and Kurtz have established "San-Serv," offering a complete series of slides, singly and in sets, which present typical specimens for study and comparison. The experience and skill of these two men, who are well known in the profession, is full assurance of the quality and completeness of the material.

The slides are selected and organized in a manner that permits a minimum number of examples to provide a maximum amount of information on both structural fragments and generalized pieces of cuticle. They are obtainable as permanent slides, and also in special depression mounts which permit manipulation and study of fragments under the microscope for training purposes. Experience has proved the value of using both types of material.

A brochure is offered which lists the slides and gives background information of immediate value on different insects and their habits. For a copy, write to San-Serv, 6157 30th St. N. W., Washington 15, D. C.

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Preparative gas chromatograph. Beckman Instruments announces its new "Megachrom," a departure from recent developments in gas chromatography, which "uses the separatory power of chromatography to fractionate and collect samples of ultrapure materials in volumes 100 times larger than possible with existing chromatographs, with no sacrifice in resolution. This makes available sizable quantities of ultrapure materials which before have been barely visible or seen only as traces on a recorder chart." The instrument, it is stated, will make possible new levels of chemical purity, and new areas of research will be open. Volatile compounds such as fatty acid esters can be separated, providing pure materials for studies in nutrition, metabolism, and heart disease. Trace materials which have not been available can be separated in quantity for study.

In flavor research, the announcement says, the isolation of pure compounds and the positive identification permitted by the Megachrom make it possible to understand the precise chemical basis of many flavors and even to "design" modified flavors. In organic chemical research, the identity and amount of side reactions can be followed, as well as the principal reaction, to simplify the understanding of the kinetics of the reaction.

For additional information write to: Scientific and Process Instruments Division, Beckman Instruments, Inc., 2500 Fullerton Road, Fullerton, Calif.

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Slide rule. Engineers and other plant and office executives may receive free from General Industrial Co. a circular slide rule, said to be easy and simple to operate, but accurate; instructions are included for multiplying, dividing, and finding proportions. Write on your business letterhead to General Industrial Co., 5738 Elston Ave., Chicago 30, Ill. (The slide rule is purchasable at 50 cents by those who do not qualify as an engineer or executive.)

• • • Patter

Odor as a taste factor. To help the Army's Quartermaster Corps provide tastier rations for the nation's armed forces, scientists at Battelle Memorial Institute, Columbus, Ohio, are investigating the relation between physical properties of substances and their effect on the human sense of smell. Thirty odorous substances are sniffed in a closed booth, and their characteristics are studied in relation to six physical properties. The research shows that these six properties are useful in predicting the characteristics of an odor, but not why and how some properties affect smell.

Howard G. Schutz, a Battelle psychologist reporting on the study, said that "In order to be smelled, a substance must come in contact with small areas of sensitive cells far up in the nose. We have learned that a substance that evaporates readily usually has a stronger smell. It seems reasonable to think that such a substance reaches the sensitive cells more readily and in greater amounts. This may be why vapor pressure and surface tension have significance in odor." On the other hand, substances with a high ability to penetrate cell tissue and those with strong properties of adhering to surfaces usually have a weaker odor, Dr. Schutz continued. The abilities of substances to absorb heat and ultraviolet radiation are also linked to pleasantness of smell.

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New flour milling building at KSC. Base bids for construction of a new building at Kansas State College, Manhattan, to replace the milling facilities lost by fire in 1957, have been submitted to the state architect. Low bids for the various project categories amount to $855,839. The appropriation of $1,421,454 was not adequate to provide for equipment or installation of grain storage, cleaning house, or milling facilities. For renovation of East Waters Hall, including class lecture rooms to be used by students in the Department of Flour and Feed Milling Industries, $565,615 was appropriated.

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Philippine flour mill enlarged. Republic Flour Mills, Inc., Manila, P.I., a 4,000-sack mill owned by local capital, is planning an addition which will double the mill's capacity. Wheat storage is being increased from 15,000 to 25,000 tons, and construction has begun on a bodega (warehouse) for 3,500 tons of flour.

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New USDA grain standards for corn. Revised standards for corn established by the USDA, to become effective October 1, 1959, were published in the January issue of the **Federal Register.** Major revisions are: 1) Minimum test weight per bushel will be higher, in numerical grades. 2) The basic method for determination of moisture content will be changed. This change will result in a net increase of about 0.5% in percentage of moisture determined.

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Macaroni plant operations forum. Macaroni and noodle manufacturers and their suppliers met in Chicago on April 16 and 17 for the

Glenn G. Hoskins Company's tenth annual Plant Operations Forum, held in a classroom in Wieboldt Hall on the Chicago campus of Northwestern University. The Hoskins company are industrial consultants specializing in the macaroni-noodle industry. The program dealt with problems in quality and production. (See photo.)

Charles and William Hoskins, partners in the company, led discussions and took part in panel talks with technical personnel from manufacturers' plants. (See Charles M. Hoskins' article, "Macaroni Industry," **This Journal,** February, 1959, p. 31.) A research program recently started by the two partners, to establish standards and control procedures evaluating the macaroni-making properties of raw materials, was brought up for consideration.

C. W. Brabender of C. W. Brabender Instruments Co. described the use of testing equipment in research and quality control. Elmer F. Glabe, director of Food Technology Laboratory, Chicago, gave specific information on tests and procedures used in evaluating raw materials and finished macaroni products. R. H. Harris, head of the department of cereal technology, North Dakota Agricultural College, Fargo, talked about breeding desirable characteristics into durum varieties to meet the needs of both farmers and macaroni manufacturers.

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New flour mill in Venezuela. International Milling Co. of Minneapolis, through subsidiary companies, has recently completed and put into operation a modern flour mill with a daily production capacity of 4,000 cwt. The mill is known in Venezuela as Molinos Nacionales, C.A. (MONACA). Ten storage tanks with total storage capacity of 500,000 bu. of wheat are a part of the installation.

New British journal. A prospectus has been received, issued by Interscience Publishers, New York and London, concerning the new **Journal of Biochemical and Microbiological Technology and Engineering.** Editors are E. M. Crook (biochemistry) and M. B. Donald (chemical engineering), both of University College, Gower St., London W.C.1; and E. L. Gaden, Jr. (chemical engineering), Columbia University, New York. The 16-member editorial advisory board includes five Americans and others from countries throughout the world.

The journal, according to its prospectus, "is devoted to reporting those processes and techniques wherein biochemical and microbiological phenomena are employed for the achievement of a technological or practical end, together with theoretical and practical investigations which make this possible. It is intended to include technical descriptions of new processes, methods, and apparatus at the laboratory, pilot plant, or industrial level; experimental and theoretical investigations pertinent to these; research directed towards an understanding of the various branches of biochemical engineering and industrial microbiology."

Among the first articles to be published is one entitled "The separation of flour fractions of different protein contents by means of air classification," by C. R. Jones, P. Halton, and D. J. Stevens. Dr. Jones is Overseas Correspondent for **Cereal Science Today,** and all three are contributors to **Cereal Chemistry.**

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Colorimeter donated to college. At the recent 10th annual Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Bausch & Lomb Optical Co. presented its 10,000th Spectronic "20" Colorimeter to Waynesburg College, Waynesburg, Pa. This donation, the Committee believes, is an outstanding example of the interest shown by American industry in stressing the importance of high-quality scientific instruments in secondary schools and colleges. Waynesburg was selected as the recipient because nearly all the college's scientific equipment was lost in a fire which destroyed the chemistry building last December.

James E. Starks (left), of Bausch & Lomb Optical Co., presents the company's 10,000th Spectronic "20" Colorimeter to Martin Spangler, Associate Professor of Chemistry, Waynesburg College.

• • •

New Florasynth catalog. Just off the press is the latest wholesale catalog of Florasynth Laboratories, Inc. Covered in green and gold, the 36-page catalog lists the flavoring, aromatic, and essential oil materials offered by this company in its national and international service to processors and manufacturers. Information is included as to use, quantity, and effectiveness of the products. Also, the cooperation and services of Florasynth's research facilities and personnel are offered toward the development and creation of materials and items according to specific requirements. Those interested are invited to write to Florasynth Laboratories, Inc., 900 Van Nest Ave., New York 62, N. Y.

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Price of lysine monohydrochloride drops. Merck & Co., Inc., Chemical Division, announces a 25% reduction in the price of lysine monohydrochloride, from $8.00 to $6.00 per pound. This reduction, together with greater research interest in lysine, is expected to open up the market further. Lysine is used by cereal manufacturers, specialty bread bakers, and the pharmaceutical industry in nutritional supplements and vitamin formulations. It has great potential for raising the nutritional value of poultry and livestock feed supplements, according to Merck.

the President's Corner

news of the association

MINUTES OF THE ANNUAL BUSINESS SESSION, Tuesday, May 5 1959

President Brooke called the meeting to order at 11:15 a.m. Congratulatory telegrams from Frank Hildebrand, Max Markley, and Donald S. Eber were read and acknowledged. Minutes of the 1958 Business Session were approved as printed in the May 1958 issue of CEREAL SCIENCE TODAY.

Reports from the Board of Directors, Treasurer, Editors of CEREAL CHEMISTRY and CEREAL SCIENCE TODAY and the Managing Editor were approved, as printed in the April 1959 issue of CEREAL SCIENCE TODAY.

Following approval of the reports of the Technical Policy Committee and the several technical committees, as published in April 1959 issue of CEREAL SCIENCE TODAY, chairman Johnson also moved for acceptance and approval of the method for testing of sweet yeast doughs as published in the October 1958 issue of CEREAL SCIENCE TODAY. This action was approved. As a supplement to the published report of the Farinograph Standardization Committe, Chairman Milner commended the fine co-operation of the manufacturers. Excellent concordance of bowl performance had been obtained and consideration was stated to be in progress for supervision or certification of mixing performance of individual bowls. This supplementary report was also approved and accepted.

The Committee on Revision of *Cereal Laboratory Methods* has been quite active. Forty-two different technical committees have been charged with the responsibility for suitable modification of specific methods of analysis for inclusion in the new edition. This 7th edition will be loose-leaf in style, of broader coverage and uniform style, and will be kept up-to-date by means of annual revisions of methods when needed. A publication date of February 1961 is anticipated. The report of this committee was approved and accepted.

Chairman Clark reported that for nearly ten years, demands for cereal chemists had far exceeded the number of those available through the Employment Committee. During this period, only one beginning cereal chemist had made use of the facilities of the committee. At present fourteen openings were available, but only three cereal chemists were known to be looking for other jobs. The History Committee has been essentially inactive during the past year, according to Chairman Mitchell. Chairman Evans indicated that a suitably inscribed scroll has been procured for presentation to W. B. Bradley by the Committee on Recognition for Retiring Presidents. Chairman Sherwood reported that the Constitution Revisions Committee had had no need for activity during the past year. The reports of these committees as well as those of other nontechnical committees that had been published in the April 1959 issue of CEREAL SCIENCE TODAY were approved and accepted.

Dr. Geddes, as representative of the AACC on the Foods Protection Committee of the National Research Council, reviewed the three meetings in which he had participated during the past year. He pointed to the danger of confusion between the questionnaires circulated by this body and somewhat similar ones used by the Food & Drug Administration in an entirely independent action. Other activities of the committee concerned evaluation of carcinogenicity of food additives, revisions for previous publications of the NRC dealing with uses of chemical additives in foods, methods of determination of toxicity of additives, and compilation of a pharmacopoeia on additives. This report was approved and accepted.

There being no new business the meeting adjourned at 11:58 a.m.

Respectfully,
JAMES W. PENCE, *Secretary*

AACC LOCAL SECTIONS

Lone Star and Pioneer Sections held a joint spring meeting at Oklahoma State University, Stillwater, on March 28. A. M. Schlehuber of OSU's agronomy department had prepared the program: a thorough survey of the literature on the subject "What do we know about wheat proteins?" by Don Abbott and a talk by L. M. Henderson on "The use of isotopes in biological research." Dr. Henderson very ably demonstrated this new use of isotopes to be as important to bacteriology as the microscope. A film describing the Baker Do-Maker process of breadmaking was also included in the program.

In the afternoon the group made a tour of the agronomy department's facilities and saw the excellent work going on in the crossing of wheat, to develop new varieties resistant to insects and fungi and to improve yields and baking quality. Cereal chemists from both sections thoroughly enjoyed the hospitality and facilities at OSU.

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Nebraska Section met on April 25, jointly with the Nebraska Bakery Production Club, at the Birchwood Club in Omaha. Two speakers made up the program. Robert Joslin of Fairmont Foods, Inc., Omaha, discussed technical problems common to dairy and cereal chemists. He suggested that it might be helpful for each to study some of the other's problems and solutions; an exchange of ideas might save much trial and error in solving certain problems. Harold McDonald of Bowman Dairy Co., Chicago, spoke on "Milk and the truth about it," outlining some of the factors that can change the properties of nonfat dried milks

and briefly explaining steps in manufacturing.

Co-winners of the Shafer trophy, given annually to the member who has the best results of the section check sample, were announced. They are Jerry Walls and Robert Pruckler.

New officers are Joe Nigro, chairman; Rex Ruckdashel, chairman-elect; Edgar Meyers, secretary-treasurer.

New members: Les Graham of Harris Laboratories, Lincoln, and Jack Cooper, O. A. Cooper Co., Humboldt, Nebr.

Location for the Section Picnic in August will be announced.

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Pioneer Section, at a meeting held April 4 at Wichita, Kansas, honored Howard H. Johnson of the Gooch Milling Co., Lincoln, Nebr., for a lifetime of service to the interests of cereal chemistry by awarding him a life membership. Mr. Johnson is shown in the photo at left; at right is James M. Doty of Doty Laboratories, North Kansas City, Mo., who made the formal presentation.

The Section also made annual awards for superior analytical work in ash, protein, moisture, and maltose determinations on the monthly Pioneer check sample. In the photo, left, is George Schiller, Pillsbury Co., Enid, Oklahoma, chairman of the trophy committee, presenting the ash trophy to Elden Smurr of American

Flours, Newton, Kansas. The other winners were: moisture – Loren Francis, Wall-Rogalsky Co., McPherson, Kansas; maltose – Wayne V. Parker, General Mills, Inc., Wichita, Kansas; protein – Marvin E. Armour, International Milling Co., Salina, Kansas.

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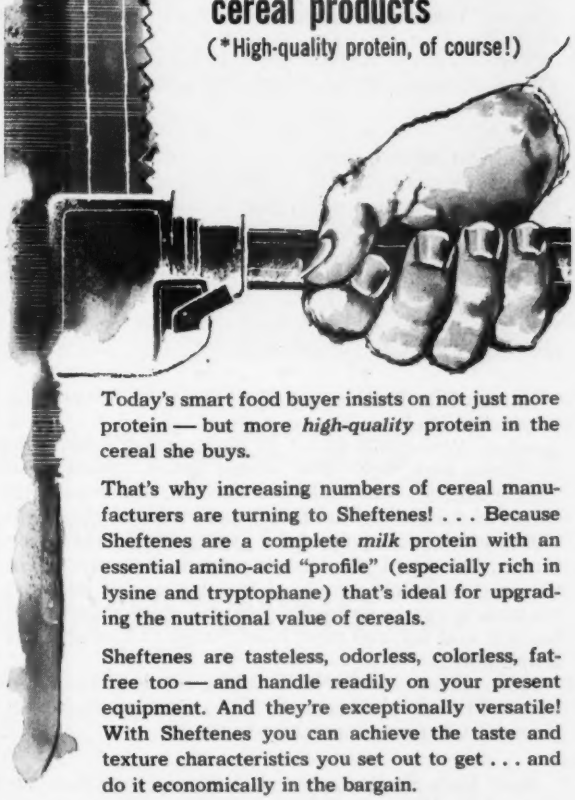

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Northwest Section held its annual election of officers on March 26. The officers for the 1959-60 season are: chairman, R. J. Pickenpack, General Mills, Inc.; vice-chairman, Edward Liebe, U.S. Dept. of Agriculture; secretary, R. H. Anderson, General Mills, Inc.; treasurer, Sheldon Greenberg, The Pillsbury Company.

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Northern and **Southern California Sections** met jointly for two days, April 10 and 11, at the Hacienda Motel, Fresno – early enough to miss the summer heat and yet a fine time for swimming. A full program included these speakers and subjects: Don Dubois of the Huron Milling Division, Hercules Powder Co., "Vital wheat gluten – why, when, and how"; J. C. Barnett of Monsanto Chemical Co., "Recent developments in phosphate leavening systems"; and C. Ray Thompson, Western Regional Research Laboratory, "The effects of processing on biologically active forage components." For entertainment at the banquet Friday evening, Ludwig Reimers showed color slides of his recent South Seas vacation.

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Pacific Northwest Section is preparing for its June convention in Seattle. Doyle C. Udy has appointed Martin Wise, Don Colpitts, and Carl Larson to act with him as the program committee.

New member Richard D. Rasmussen, chemist at Fisher Flouring Mills, Seattle, is welcomed by the Section.

• • •

Midwest Section enjoyed a tour of the Quaker Oats Company's John Stuart Research Laboratories and livestock farm on April 6. The laboratories and pilot plants, opened in 1956, are housed in a new, modern building of 87,000 square feet. The tour illustrated work that is being carried on in four major areas: foods, feeds, pet foods, and chemicals. Cocktail hour was followed by a filet mignon dinner at Grier's Supper Club with ladies as guests.

• • •

Kansas City Section met April 17 at the Advertising Executive Club in Kansas City. Topic of the guest speaker, Walter Whitman of Massachusetts Institute of Technology, was "Our atomic policy." With fourteen countries currently at various developmental stages of the atomic bomb, he predicted that the bomb will not be a monopoly of the great powers very much longer. He urged greater cooperation between scientists and technical people of the world, and personal contacts between nationals to break through political barriers and achieve freer interchange of thought and information.

New officers elected and taking office at once are Lester Fischer, chairman; R. T. Craig, vice-chairman; Edward Chapman, secretary-treasurer.

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New York Section's March 10th meeting was addressed by Albert R. Robbins, on "Properties and potential application of amylose." Mr. Robbins is manager of the development department, Stein, Hall & Co., Inc. He said that amylose is being produced commercially by fractionation of potato starch, and the breeding of high-amylose corn should increase the supply. Research now under way is expected to develop new industrial uses for amylose when it is available, as well as for amylopectin. Mr. Robbins described the properties of amylose and discussed such potential uses as films for food packaging and sausage casings; coatings for paperboard; permanent finish for fabrics and binder in nonwoven fabrics. It has possibilities in conjunction with wood pulp in paper, and may be useful in controlled gelation or in quick-setting, stiff, irreversible gels. Work remains to be done, Mr. Robbins pointed out, in two problem areas – plasticizing and water-insensitivity. A lively discussion followed the session.

The last meeting of the season was held on April 14. C. W. Bice, manager of technical research for the R. T. French Co. of Rochester, N. Y., spoke on "New applications of spices." He said that spices, even of the same species, differ markedly when grown in different areas or when ground to different degrees. Two cardinal rules to be observed in purchasing are: buy the best quality for the purpose, and order only a reasonable quantity at a time. Spices are best stored in a cool, dry place.

Dr. Bice also discussed the antioxidant properties of some spices, the value of spices in therapeutic diets, and some rather unusual uses for them such as sesame seed in piecrust for chocolate and pumpkin pies; caraway seed in meat-pie crust; and mace or nutmeg in shortcake or biscuits. Allspice and cinnamon are intriguing additions to blueberry pie, and mace or clove to cherry pie.

The session closed with a lively question-and-answer session. Members and guests examined samples and were given usage charts for spices and herbs.

New officers for the 1959–60 season: E. C. Edelmann, chairman; W. J. Simcox, vice-chairman; R. A. Morck, secretary-treasurer.

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Canadian Prairie Section on March 17 had the pleasure of hearing from R. Kipp of Kipp Kelly Co., Ltd., who is known as the Marco Polo of modern Winnipeg. A well-known world traveler and Winnipeg businessman, Mr. Kipp spoke on his recent tour in Russia where he was a guest of the head of all Russian milling and engineering works. He told of advancements in Russian milling and education, and of the tremendous strides in milling technology that have taken place in recent years. He concluded with a showing of very interesting color slides.

The annual business meeting on Tuesday, April 21, included a tour of the O'Keefe Brewery and began with buffet supper at 5:30 in the hospitality room of the brewery. Auditors were appointed and new officers for 1959-60 were elected: L. Johnson, chairman, and W. Bushuk, vice-chairman; L. Rennie continues as secretary-treasurer.

Dr. Bloksma's talk at the February meeting covered graphical comparisons between Canadian and Holland grain crops. He dwelt on the utilization of the various crops in Holland, and on the various methods of control used in cereal production. Of particular interest was his interpretation of the effects of oxidation on protein or gluten in doughs.

A committee of three was appointed to organize a joint meeting of AACC and AOM to be held in Winnipeg next November: L. Rennie, W. J. Eva, and N. Irving.

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Niagara Frontier Section met on April 13 at Erie County Technical Institute to hear speaker H. Leigh Woehling, manager of animal nutrition department of International Salt Co., Scranton, Pa. Mr. Woehling traced the origin of salt, its early history, and its development from simple solar evaporation to the present vacuum system. Color slides of salt mines in central New York and near Detroit, Michigan, were shown, and numerous questions were answered in open discussion.

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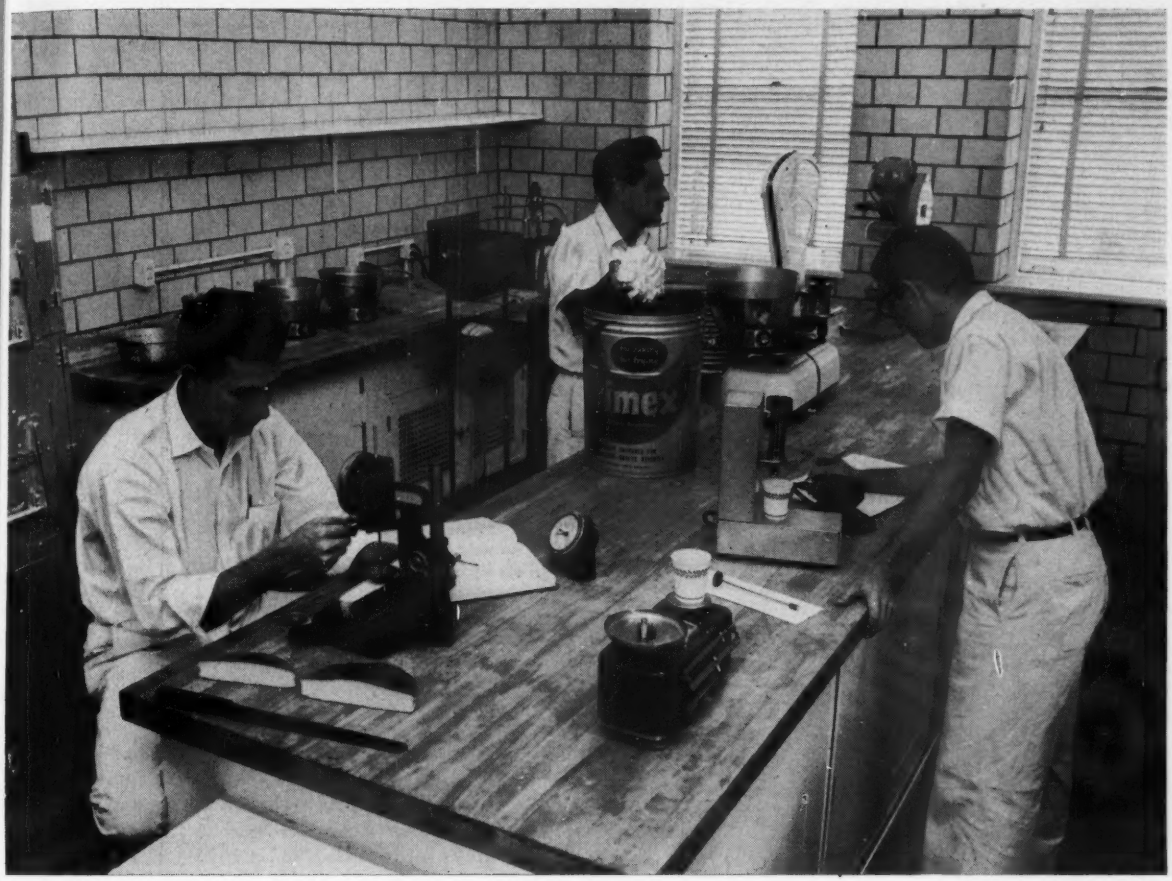

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Central States Section's February dinner and business meeting (on the 27th) was held at Sands Motel Rathskeller, St. Louis, and began with a social period in the private bar. Opening the program later, National President Clinton L. Brooke talked informally about Association affairs and plans, and then took part in a discussion of plans for the National meeting to be held in St. Louis in 1962. The film, "Baker Do-Maker process for the continuous production of bread" was shown. To conclude the program, Robert P. Joslin, director of research, Fairmount Foods, Omaha, Nebraska, spoke on technical problems in the development of cereal and dairy products.

Central States Section met on April 24 at the plant of Anheuser Busch, Inc., and heard V. P. Cirillo of that company explain fundamental research work on submerged culture of mushroom mycelium.

New members are Thomas E. Shaughnessy and Herbert H. Etter, both of Russell-Miller Milling Co., Alton, Ill.

New officers elected: A. Handleman, chairman; Thomas Shaughnessy, vice-chairman; John T. Watson, secretary-treasurer.

The next meeting will be in September.

MORE ON FOOD ADDITIVES

The December 1958 and January 1959 numbers of *Food-Drug-Cosmetic Law Journal* together carried the full report on the food additives conference held in Washington November 24-25, 1958. In March, articles by A. J. Lehman and 16 associated staff members of FDA on "Appraisal of the safety of chemicals in foods, drugs, and cosmetics" became available as a separate booklet. Copies may be obtained from J. F. Lakey, Sec'y-Treas., Assoc. of Food and Drug Officials of the U.S., c/o Texas Dept. of Health, Austin, Texas; price, $2.00 per copy. Methodology and interpretations discussed therein are not official but certainly express useful and informed views. The Final *Order* on Subpart A, Definitions and Procedural and Interpretive Regulations, was published in the *Federal Register*, pages 2434–2440, March 28, 1959. Submission of Comments on Subpart B relating exclusively to additives proposed for exemption from the requirements of further testing was extended to April 9th. As of May 6th no final order has issued on this "first installment" of a "white list" of additives exempted from further testing, but it is expected soon. Supplementary additions to the list are expected thereafter as circumstances warrant. In the *Federal Register* of April 21, pages 3055–3057, the FDA published a list of 150 natural seasonings and flavorings which are *Proposed* for exemption from testing requirements of the Food Additives Amendment of 1958 because they are generally regarded by experts as safe for use in food. All interested persons were invited to file comments within the 30-day period designated.

COLORING OF ORANGES

The coloring of Florida and Texas oranges with the newer colorant, Citrus Red No. 2, is permitted until September 1, 1961, under new legislation, March 17, 1959, Public Law 86–2. At this writing a new over-all *color additive* bill, drafted by the FDA, is being reviewed in the Executive Branch of the government. Among other changes, such a bill may likely provide for the establishment of permissible tolerances.

NEWS SERVICE

Food Chemical News is a new weekly report by Louis Rothschild, Jr., editor and publisher, 1011–12 Warner Building, Washington 4, D. C., which provides information "in depth" on food additives, feed additives, related legislation and allied subjects. Those interested may want to write Mr. Rothschild for further information. His reports are of great interest and assistance to many concerned with these subjects.

FOOD STANDARDS AND DEFINITIONS

The program on Definitions and Standards of Identity of Foods seems to be moving along a little faster. Despite the best intentions of everyone concerned, and even with the benefits of the Hale Amendment permitting revision of standards without compulsory Hearings when there is no controversy, standards-making and standards-revising is a tedious task. It merits sympathetic cooperation and a willingness for all parties to appreciate fully that there are at least two sides (and often many more) to every situation. In the cereal products area a new revision of the bread standard now permits addition of vital wheat gluten up to 4 lb. for each 100 lb. of flour. This will make a stronger dough and is expected to strengthen the "hinges" of rolls cut for insertion of frankfurters. Also, in bread with raisins it helps maintain more uniform distribution of the fruit. On pages 210–226 of the *Food-Drug-Cosmetic Law Journal*, March 1959, a report is published on "The current status of the food-standard program" by H. Thomas Austern. He is Chairman of the Food Standards Committee of the Section on Food, Drug, and Cosmetic Law of the New York State Bar Association.

USDA FOREIGN CONTRACTS AND RESEARCH PROGRAM

The U.S. Department of Agriculture has recently started new research programs abroad, with G. E. Hilbert as Director of the Foreign Contracts and Grants Program. Funds are available for this work under Public Law 480, resulting from the sale of surplus U.S.-grown crops. Section A provides for utilization research and Section K provides for research on farm crops, forestry, and agricultural marketing. The research to be conducted in foreign scientific institutions through grants or contracts is to be financed by foreign currencies. The research projects are expected to be of benefit to this country and to the countries in which the work will be done. For the present, work is projected in certain European countries with similar efforts to follow in the Far East and in South America.

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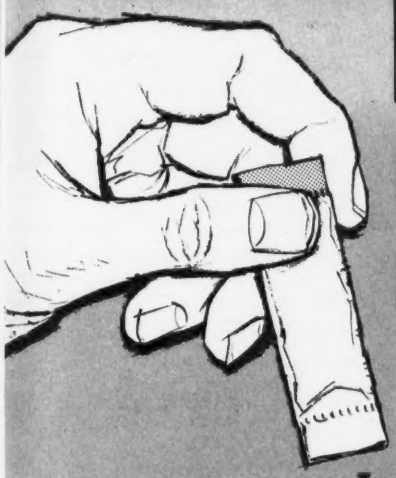

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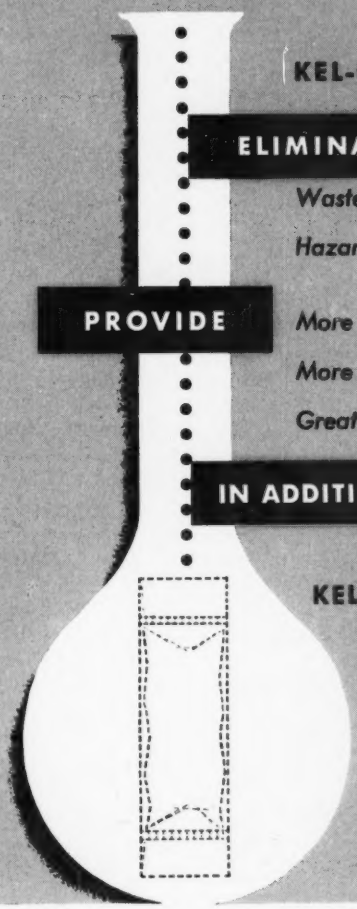

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Observations

We have just enjoyed a most profitable experience and an excellent program at the annual meeting of the American Association of Cereal Chemists. I am sure every member who attended the meeting joins me in sincere congratulations to all who worked to make this meeting such a success.

As we look ahead, there are many projects that we should be working on between now and the next annual meeting. In our laboratories we feel the need of a laboratory dough mixer that will develop a dough in a similar manner to that obtained in commercial continuous mixing. We are working on a method to determine the amount of protein damage in flour. We feel the need of a dependable method of determining particle size of commercial flours. It appears to us when we gas bleach the vital gluten portion of a flour separately from the starch portion of a flour we get very little bleaching effect on the recombined flour in the baking test. On the other hand, when we gas bleach the starch portion of the flour we get a very marked effect on the recombined flour in the baking test. If our ideas of oxidation of wheat gluten are correct, we need to study the reason for these differences.

In these brief observations it is impossible to even mention research needed but a few thoughts are pointed out in the hope that all of us will get to work. Complacency is the greatest foe of advancement. Every cereal chemist wants to advance but too many of us refuse to put out the extra effort required to move ourselves ahead. Let us all resolve to put out extra effort this year and make our 1960 annual meeting even more worth-while.

Jim Doty

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MILLING FEED ANALYSIS
VITAMIN ASSAYS
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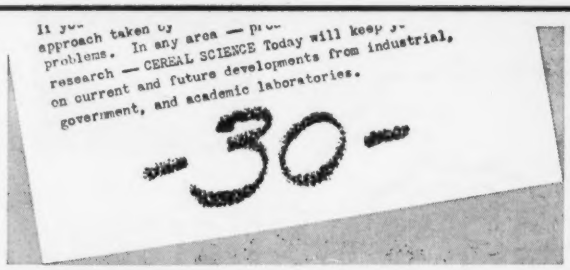
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-30-

ANNUAL MEETING REVISITED

For the large number of members who saw Washington, D. C., for the first time, the beauty of our nation's capital lived up to their expectations. Trying to find time to tour the city was the biggest problem — due mostly to the excellent technical program. Many of the technical sessions had standing room only. Probably accounting for this was the diversity of papers represented and the great interest shown in them. The talks certainly demonstrated the breadth of A.A.C.C. activities. At any rate, we are now looking forward to an all-time record-breaking crowd at the 45th Annual Meeting in Chicago, May 1-5, 1960.

YOUR ISSUE IS A LITTLE LATE . . .

. . . but this was done intentionally, as indicated in the April issue, so that we could cover the Annual Meeting. There were so many excellent pictures taken that we will run another picture story in the July issue of CEREAL SCIENCE TODAY. Many of the informal pictures used in this issue, as well as those to be used in the July issue, were taken by Mrs. Panalee Ikari, U. S. Food & Drug Administration, and Bill Simcox, Distillation Products Industries. Panalee and Bill were in charge of publicity for the Meeting.

A VISITOR FROM AUSTRALIA

An old friend of the Association, and former Managing Editor of CEREAL CHEMISTRY, Dr. Robert A. Bottomley, paid us a visit at our St. Paul Headquarters the latter part of April. Bob, who is on an extended trip that will eventually take him around the world, is a vice president with Mauri Brothers and Thomson, Ltd., Sydney, Australia. He spent a few weeks in St. Paul visiting old friends and staff members on the St. Paul Campus of the University before going on to Winnipeg, Manitoba. Bob attended the Annual Meeting in Washington and then planned to visit in the East before going overseas.

He is presently our Corresponding Editor for Australia.

THIRD SANITATION TRAINING SCHOOL

The third and last of the AACC Sanitation Training Schools, sponsored in cooperation with the Food and Drug Administration, was held at the American Institute of Baking, Chicago, April 12 to 17. Kenton L. Harris and O'Dean L. Kurtz, experts in the identification of insect fragments based on microscopic morphology of insects, were again in charge of the daily lecture-laboratory sessions. The first and second of the series were held in San Francisco and New York City, respectively; all have been highly successful.

Enrollment in Chicago was much above the anticipated and planned-for attendance, and considerable electrical equipment had to be improvised to handle the microscopes and their lights. The more than 50 participants were from member firms of the American Institute of Baking, the Quartermaster Corps, and the USDA; baking, milling, canning, freezing, and other food industries were represented. Regular classes of the Institute were adjusted to make lecture space available.

While all comments on a personal level have been extremely complimentary towards the Food and Drug Administration, the A.A.C.C. would like to suggest that these same comments be passed on in writing to George L. Larrick, Commissioner of Foods and Drugs, U.S. Food & Drug Administration, Washington 25, D. C. It is important that the FDA have on record our comments regarding the importance and usefulness of these schools, if other parts of the country are to have an opportunity to have similar schools in their locality.

R.J.T.